Foreign Firms, Price Competition and Entry Decisions: Evidence from the Korean Experience

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Thesis submitted in full fulfilment of the requirements for the degree of

Doctor of Philosophy in Economics

The University of Warwick

Department of Economics

May, 2006

To my wife and two sons

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Acknowledgments

I am deeply indebted to my supervisors Keith Cowling and Michael Waterson whose invaluable advice and encouragement helped me tremendously in completing my research. I would like to thank other members of staff and students at the University of Warwick for their help and comments. I would like to acknowledge seminar participants at Birmingham University and UEA for helpful comments on my preliminary research.

The data were obtained with the kind help of the Korean Statistical Office, the Korean Chain Store Association, and the Bank of Korea. And I wish to thank several colleagues from the Korea Fair Trade Commission and many industry experts for providing me with detailed background information on the industries of my study. I am also grateful to the Korean Fair Trade Commission who supported me financially and has patiently waited for me to finish my research. Finally, special thanks go to my family and friends for their constant support throughout my research.

Summary

This thesis studies the competitive role of foreign firms in the host economy. While the popular belief is that foreign firms act as new competitive forces in the host economy, many observers argue that the essence of oligopoly will prevail without foreign firms having any significant impact on competition. To decide which argument is more realistic, this thesis conducts three empirical studies: one on the impact of foreign acquisition on price competition, one on the competitive effect of greenfield FDI firms, and lastly one on entry decisions.

The first chapter sets up the main hypotheses to be tested, and briefly outlines the thesis. Chapter 2 investigates the impact of foreign acquisition on price competition, utilizing the sharp contrast in foreign firms' roles before and after foreign entry in several Korean industries. The estimation strategy is to compare the level of market competitiveness between the two periods through the response of prices to marginal costs. Largely the empirical findings do not support the popular belief.

Chapter 3 examines the effect of greenfield FDI firms on price competition, employing the empirical opportunity offered by the grocery superstore sector in Seoul. Focusing on the existence of difference or rivalry between domestic and foreign firms, I develop more specific hypotheses: foreign firms are more competitive in their pricing policies; in response, domestic firms adopt more

competitive pricing strategies; as a result, the price competition is fiercer where foreign firms have entered. The findings indicate that there is no difference or rivalry between foreign and domestic chains.

Chapter 4 investigates firms' entry behaviour to infer the underlying nature of competition between foreign and domestic firms. For the test, I utilize entry decisions observed in the Korean grocery sector, which is a fast-growing industry. I check how differently foreign firms behave compared to their domestic counterparts and how they react to each other, using the latent regression of entry decisions. Intense rivalry among large chains in general is found, rather than the rivalry between domestic and foreign chains, implying that foreign firms behave as a member of an oligopoly group rather than as a kind of maverick. Chapter 5 contains some concluding remarks, and discussions on the limitations of the study and possible future work.

Chapter 1

Introduction

Inward Foreign Direct Investment (hereafter FDI) firms play increasingly important roles in the modern economy as multinational corporations (hereafter MNCs) keep expanding their cross-border production establishments. The operations of FDI firms can affect the host economy in various aspects, ranging from direct impacts on tax, employment and capital formation to indirect effects like technology spill-over. Among these, the competitive consequences of FDI firms have an important implication for the short-run efficiency as well as the long-term development of the host economy. If they can act as more competitive forces, as many people argue, FDI firms could remove or alleviate monopolistic or oligopolistic distortions. Or they could force local firms to increase technical efficiency or X-efficiency. Furthermore, their competitive pressure can speed up the technological evolution of local firms.

In an attempt to assess this competitive impact of FDI firms, a small number of studies have examined the margin effects of FDI firms. The main hypothesis is that FDI firms are, as new entrants to a national market, likely to act as disrupting competitive forces. Although any entrant could disrupt an industry with few firms, as Caves (1971 and 1996) and many others argue, foreign firms unfamiliar to the local

way of running business are less likely to settle down to the prevailing collusive cooperation between local firms. As a consequence, inflows of FDI firms could bring more competition in the host economy, resulting in lower profits earned by domestic firms (or the industry as a whole). That is, a large presence of FDI firms is expected to adversely affect firms' profitability. Based on this hypothesis, Caves (1974), Co (2001), and Chung (2001) have examined the statistical relationship between foreign firms' presences and industry (or domestic firms') profits by utilizing cross-sectional variations across industries. Their general findings are that increases in foreign presence lower industry's profits, supporting the hypothesis.

The main limitation of these studies is the reliance on cross-sectional data, apart from the measurement error of profits and endogeneity problem found in the traditional Structure-Conduct-Performance (hereafter SCP) paradigm. Based on cross-sectional data, they attempt to establish whether variations in the presence of FDI firms across industries help to explain industry margins. This estimation strategy greatly depends on the restrictive assumption that inter-industry variations can be captured by a small number of observed variables. To the extent that the industry-specific factors are not fully controlled, the estimation results are biased. An alternative approach is, as the New Empirical Industrial Organization (hereafter NEIO) paradigm argues, to examine the competitive effect of foreign firms within the context of a single industry. However, the main obstacle to the use of this approach is the availability of data.

In this regard, recent developments in Korean industries provide an ideal opportunity for empirical tests. A large scale of foreign acquisitions in the aftermath

of the economic crisis in 1997 has created stark asymmetry in foreign firms' role in many industries. Until then, the Korean economy was characterized by the least reliance on FDI firms in the world, with a handful of domestic conglomerates dominating the economy across industries. This unique set-up opens up a chance for researchers to compare market competition between the two periods before and after foreign entry. Another opportunity arises from the liberalization of FDI regulation in the retail sector, which was followed by the rapid expansion of chain networks along with a large scale of foreign entries by several global giants. The nature of localized competition in the retail sector allows us to observe cross-sectional variations in foreign firms' presence within the context of a single industry.

Another advantage of the emphasis on a single industry is that we can easily differentiate between M&A and green-field FDI. The entry mode of foreign firms affects their subsequent competitive consequences. While greenfield entry at least initially adds one more firm to the market, the acquisition of existing firms leaves market concentration unchanged. Consequently, greenfield FDI firms are expected to produce more competitive outcomes. In contrast to the previous studies, which attempted to deal with heterogeneities arising from different entry modes by introducing a control variable, this dissertation examines the competitive effect of each entry mode separately, using the two empirical settings above. The first setting is all mature industries where only foreign acquisitions took place. By contrast, the second one is a newly developed industry, so that foreign firms have no choice but to enter the market by building their own stores.

In constructing hypotheses to test, I introduce another line of argument concerning the competitive role of foreign firms, in addition to the popular one that foreign firms have a positive influence on market competition. The essence of oligopoly, i.e. the coexistence of rivalry and collusion, as Cowling (1982), Cubbin (1988) and others argue, may underlie the competition among firms in these industries. Where a small number of firms are competing, price cuts by any firm can easily be detected and invite retaliation from competitors, resulting in the loss of profits for all the participants. Thus, in oligopoly, there may be strong motivation for firms to accommodate each other's presence to the extent of avoiding the worst situation where all the firms are losing profits. Foreign firms are also expected to place this consideration at the forefront of their strategies. As a consequence, being either a foreign or domestic firm makes little impact on competition.

Although the first argument is popular, the question is mainly an empirical matter. A simple approach is to examine whether there is an increase in market competition after foreign entry using time series data, where finding an increase in competition will support the first argument. Another estimation strategy is to ask whether foreign firms differ in competitive behaviour from their domestic counterparts, and how they react to each other. If foreign firms act as a pro-competitive force, as the popular belief expects, difference or rivalry between home-based and foreign firms is more likely to be found. In contrast, if the essence of oligopoly prevails, difference or rivalry between domestic and foreign firms will hardly be observed.

To decide which argument is more realistic, this dissertation conducts three empirical studies. Chapter 2 utilizes the sharp distinction of foreign firms' role in several industries which received foreign acquisitions after the economic crisis. Following the first estimation strategy, I compare the price competition before and after foreign acquisitions. Chapters 3 and 4 take advantage of the rapid expansion in the grocery superstore industry, adopting the second estimation approach. Focusing on price competition, Chapter 3 asks whether domestic and foreign firms differ in pricing policies and how intense rivalry between them evolves. In contrast to the other chapters examining price behaviour, Chapter 4 investigates firms' entry behaviour, from which I attempt to infer the underlying nature of competition between domestic and foreign firms. The main questions are how different domestic and foreign firms are in terms of their entry behaviour and how they react to each other's presence.

Turning to each empirical study, Chapter 2 examines the price competition between the two periods before and after foreign acquisition in the context of a single industry. Concerning the effect of foreign acquisition on price competition, there could be two competing scenarios. One is the traditional explanation that FDI firms are, as newcomers, likely to upset stable collusiveness between local firms and increase independent behaviour in the market. The other is that foreign acquisition results in only a shift of control over firms from domestic to foreign hands, and that the essence of oligopoly may remain effective: a coexistence of rivalry and collusion. Therefore, the first hypothesis predicts more competitive pricing behaviour after

foreign acquisition, while the second one anticipates no difference in pricing behaviour between two periods.

The estimation strategy is to compare the level of market competitiveness between the two periods through the responses of prices to marginal costs. The basic idea is similar to Sumner (1981), who attempts to infer the level of market competitiveness from the responses to excise tax on cigarettes. The underlying intuition is that for a given increase in marginal cost, the extent to which firms pass on the increase to prices is supposed to reflect the degree of market competitiveness.

However, there is a problem in Sumner's approach, in that results greatly depend on the demand specification, which we cannot know *a priori*. To deal with this, in formulating the empirical model, I construct a pricing equation based on a very general form of demand function proposed by Genesove and Mullin (1998), which can incorporate the linear, the log-linear and the quadratic demand as well as the exponential demand curve. The introduction of a general form of demand function creates a disadvantage that we can only compare relative changes in market competitiveness, although this feature is still appropriate for the analysis in question. The focus on relative changes is partly motivated by the fact that an absolute value of market competitiveness is not easy to interpret, apart from monopoly and perfect competition.

Another issue arises when we attempt to decide whether a relative change in the responses of prices to marginal costs implies an increase or decrease in market competition. Because the interpretation greatly depends on the sign of the convexity index, a key part of the demand specification, we cannot decide what this change

really means without further information or assumptions. The prior information about marginal cost can help to decide the sign of the index.

For the empirical test, this thesis utilizes the sharp contrast in foreign firms' roles before and after foreign acquisitions in the oil, paper, whiskey, lysine and carbon black industries. These industries have several common features favourable for the test. They employ simple fixed-coefficient production technologies from which we can derive partial information on marginal costs. They have undergone few structural changes other than foreign acquisitions, free from other sources of noises. In fact, estimation results do not seem to support the common belief that foreign firms increase competition, although they are slightly mixed. While in rather isolated cases foreign acquisitions produce more competitive behaviour, in most cases they are found to be irrelevant to market competition or even reduce it. In conclusion, these findings suggest that the essence of oligopoly is a more dominant factor in the competition.

Chapter 3 investigates the effect of green-field FDI firms on price competition within the context of a differentiated product industry. The focus lies on the existence of difference or rivalry between domestic and foreign firms regarding price competition. For the test, I set up three hypotheses: (1) foreign firms are more competitive in their pricing policies: (2) in response, domestic firms adopt more competitive pricing strategies where foreign competitors have a presence: (3) as a result, the price competition is fiercer where foreign firms have entered. If the traditional belief holds true, then the difference or rivalry between foreign and domestic firms will be significant. On the other hand, if general oligopoly

considerations are more important, the difference or rivalry between them hardly emerges.

The empirical setting is the grocery superstore sector in Seoul from Jan. 2001 to Dec. 2003. This is a rich environment for the testing of FDI firms' effects. First, the existence of local markets allows us to observe cross-sectional variations in foreign presence, as well as those over time. Second, the availability of store-level price data provides a chance to compare pricing behaviour among chains. Since direct sales data or store traffic data is not available, however, I construct market shares based on the parking space of superstores, where a small test supports a high correlation between parking space and sales.

For the test, I construct a reduced form of pricing equation based on a simple logit model. Unlike other studies imposing an equilibrium concept like Bertrand competition, I set up a model where the degree of market competitiveness is measured as a free parameter. Although it is analytically very simple, the logit model has a well-known drawback, the Independence from Irrelevant Alternative (hereafter IIA) property, which produces unrealistic implications in many settings. In the Korean grocery superstore industry, however, the IIA property is likely to a large extent to reflect the economic reality, where superstores as a new sector are expanding at the expense of other grocery stores which have a larger market share. The estimation strategy is to compare the level of market competition between the groups of firms in question using a standard dummy variable technique. For example, for the first hypothesis, I form two groups of chains, foreign and domestic chains,

and then compare the relative difference in market competitiveness between the two periods in question.

The findings indicate that there is no difference or rivalry between foreign and domestic chains, rejecting all three hypotheses set up above. This result strongly suggests that oligopolistic consideration is more important than the distinction between foreign and domestic firms. To further the argument, I conduct an additional test on the hypothesis that leading chains may be different from small chains, finding a significant difference in pricing behaviour. Given that the leading chains are a group of local and global retail giants, this finding also supports the main result, that foreign firms have no significant effect on price competition.

Compared to other chapters examining the nature of price competition, Chapter 4 investigates firms' entry decisions to infer the underlying nature of competition. In a chain-store industry where a number of stores are run under common ownership or management, entry decision can be a strategic choice used to avoid competitive pressure from competitors. While profits, prices or costs are unobservable directly, we can observe the entry decisions made by firms. With the assumption that entry decisions are made based on post-entry profits that firms expect given market and competitive conditions, then we can infer the nature of underlying competition from these entry decisions.

For the test, I utilize entry decisions observed in the Korean grocery superstore sector from 1997 to 2004. This empirical setting provides an ideal context for the comparison of entry decisions among firms. First, a number of entry occurrences are observable thanks to the rapid expansion and a large scale of foreign

entry. Second, comprehensive firm-level entry data are available. Although looking at the same sector as Chapter 2, Chapter 3 could produce a broader picture of competition in this sector since the data set covers all the stores in Korea. These features combined make it possible to allow for asymmetry between firms' entry behaviour. Given the fact that the industry is dominated by five leading chains, I focus on the strategic interactions among them. I identify 160 local markets based on the Korean local government areas.

Following Bresnahan and Reiss (1990) and Berry (1992), I construct a discrete choice model where entry decisions are related to market demand and competitive conditions. A sequential move game is assumed to secure a unique equilibrium: larger chains are assumed to move first and smaller chains follow next. For a robust check, I try alternative orders of entry, obtaining similar results. Since entry decisions in oligopoly are strategic in nature, an endogeneity problem arises related to market structural variables, especially in the leaders' estimations. While followers take leaders' entry decisions as given, leaders take account of followers' responses in making their decisions. To deal with this, I create leaders' conjectures on followers' optimal responses based on a simulation technique, which extends Toivanen and Waterson's (2001) methodology into an oligopoly industry.

For the test, I set up two hypotheses: (1) firms care about how many competitors they will face after entry, that is, whether they are concerned with overall market structure in their entry decisions, as the traditional wisdom of industrial organization expects; (2) firms are more concerned with who the competitors they will face are, that is, there could be a more intense rivalry between

certain groups of firms, like foreign and domestic firms. The estimation strategy is as follows. For the first hypothesis, I estimate the latent regression of entry decisions on the number of competitors by chain. Then I compare the entry pattern between domestic and foreign chains to see how different they are. Second, to see how intense rivalry between them evolves after foreign entry, I check how they react to foreign and domestic rivals' presence.

The first finding is that there is asymmetry in entry behaviour between domestic and foreign chains. While foreign chains do not care about how many competitors they will face after entry, domestic firms avoid entering markets with the growing presence of rivals. However, further examination does not support the intense rivalry between domestic and foreign firms. Domestic (foreign) firms do not react sensitively to foreign (domestic) rivals' presence. Instead, a distinctive entry pattern between large and small chains emerges, where three large chains sensitively react to each other's presences, supplying strong evidence for the intense rivalry between leading firms. Again, the results indicate that an oligopolistic consideration is a more important factor in competition. The finding that foreign firms care less about overall market structure simply implies that they might be more optimistic about post-entry profits or that they prefer established markets to new ones.

To summarize, this thesis examines the competitive role of FDI firms. The popular view argues that foreign firms new to a national market tend to act as a pro-competitive force, while an alternative view can be developed, that the coexistence of oligopoly rivalry and collusion is more fundamental. Since the question is basically an empirical matter, the thesis conducts three empirical tests, using unique

settings in Korea. The general findings are not consistent with the popular view that foreign firms have a positive effect on market competition: (1) no systematic differences are found in price competition between the two periods before and after foreign acquisition, suggesting that foreign acquisition has little significant effect on market competition; (2) instead of the difference or rivalry between domestic and foreign firms as the popular view predicts, asymmetry between leading and small firms' pricing behaviour is found, indicating the rivalry between leading firms is more important; (3) the intense rivalry among leading firms is inferred from their entry decisions, reinforcing the results of the second study. These findings combined strongly support the alternative view, that considerations as a member of an oligopoly group are a more dominant factor in firms' competition in oligopoly.

This dissertation proceeds as follows. Chapter 2 covers the empirical tests on the competitive impact of foreign acquisition, where I exploit the sharp contrast in foreign firms' role found in Korean industries. Chapter 3 investigates the effect of green-field FDI firms on price competition using the empirical setting of the grocery superstore industry in Seoul. In contrast to the preceding chapters, Chapter 4 examines entry decisions of firms to infer the underlying nature of competition in the Korean grocery superstore industry. Chapter 5 concludes by summarizing the results and discussing possible future work.

Chapter 2

Foreign Acquisition and Price Competition

2.1 Introduction

In the aftermath of the East Asian economic crisis in 1997, many Korean conglomerates, so-called Chaebols, had to sell off their divisions or companies simply in order to raise cash. This inevitably led to a large scale of foreign acquisitions across industries for the first time in the Korean economic history, allowing foreign firms to become major players along with Chaebols in many industries. Until then, the Korean economy had been characterised by the lowest reliance on FDI in the world, with a small number of domestic conglomerates dominating the economy. Therefore, foreign acquisitions created a sharp contrast in foreign firms' roles before and after foreign entry in these industries, which provides an ideal opportunity to assess the effect of foreign acquisitions empirically.

FDI firms affect the host economy in many ways: they could directly influence macro variables like capital formation, tax revenue and employment: on the other hand, FDI may also affect the conduct and performance of locally owned firms indirectly. Of these, the competitive impact of foreign firms has an important implication for the short-run efficiency and the long-term prosperity of the host economy. If they can act as more competitive forces, FDI firms could remove or

alleviate monopolistic or oligopolistic distortions. Or they could force local firms to increase technical efficiency or X-efficiency. Furthermore, their competitive pressure can speed up the technological evolution of local firms.

This was the view strongly held at the time in Korea. From the perspectives of competition and industrial policy, there was high expectation that foreign firms might put more competitive pressure on domestic conglomerates and force them to improve their productivity where oligopolistic inefficiency and collusion was believed to prevail.

Theoretically, the effect of foreign acquisition on market competition depends on the interaction between foreign and domestic firms, more importantly on foreign firms' behaviour. Insofar as foreign firms' behaviour is concerned, there could be two competing hypotheses. The first one is that an FDI firm, especially as a newcomer to a market, may "upset the prevailing collusive tranquility" and "reduce the quasi-rents that can allow inefficiency to persist" (Caves, 1974). As newcomers, foreign firms have not settled into the stable pattern of oligopolistic interdependence or mutual accommodation that will normally evolve among a market's long-term tenants, so that their pricing strategies are likely to disrupt established patterns and increase the amount of independent behaviour (Caves, 1971). As a consequence, foreign entry is expected to produce more competitive behaviour in the market.

The second hypothesis is that foreign acquisition mainly results in a change of ownership and a shift of control from domestic to foreign hands. The essence of the oligopoly may remain effective: a coexistence of rivalry and collusion. If a firm cuts its prices in an oligopoly market, it may invite retaliating price cuts from rival

firms and this may result in the loss of profits altogether. Therefore, firms have strong motivation to accommodate each other's presence to the extent of avoiding situations which leave all the firms in a worse position (Baran and Sweezy, 1966, and Cowling, 1982). It may be the case that, as Caves (1971) noted, the innate risks of FDI could force foreign firms to take a cautious course, avoiding an independent action. Therefore, this line of argument anticipates no significant difference in competition between the two periods before and after foreign acquisition.

Though the first argument is widely accepted, the question is basically an empirical matter. However, few studies (Caves, 1974, Chung, 2001, and Co, 2001) have empirically examined this issue. Their estimations are based on the logic that if foreign firms have the virtue of increasing market competition, greater foreign presence corresponds to lower industry profits. So, they investigate the statistical relationship between foreign firms' presence and industry profits across industries, finding that the results support the popular argument. However, their methodology is subject to the well-known criticisms of the traditional SCP paradigm: individual industry idiosyncracies, as they implicitly assume, cannot be fully controlled by a small number of observable variables: profit measures are not free from the measurement error which arises from unobservable marginal costs.

To avoid the shortcomings of the previous studies, this study takes the NEIO approach, returning to the old tradition of case studies of individual industries. The estimation strategy of the study is to compare the level of market competitiveness between the two periods before and after foreign acquisition through the response of prices to marginal costs. This methodology is similar to Sumner's (1981) idea, where

he attempts to proxy market power from the response of prices to excise taxes on cigarettes. Apart from the availability of a direct measure of marginal cost, this methodology has a problem that, as Genesove and Mullin (1998) show, the results greatly depend on the demand specification, which we cannot know a priori. In dealing with this, I construct a pricing equation based on a very general form of demand function, which is a unique feature of the study. This is possible by focusing on the relative changes in market competitiveness between the two periods rather than on absolute values. The focus on relative changes is partially motivated by the criticism that it is not easy to interpret the meaning of an absolute value except for monopoly and perfect competition. As explained later, the interpretation greatly depends on the sign of a convexity index, which is a key ingredient of the demand specification. This study allows the data to speak for themselves in deciding the sign of the index, with the help of a direct measure of marginal cost.

For the empirical test of the hypothesis, this study takes advantage of the disparity in foreign firms' roles before and after foreign acquisition in several industries in Korea. As mentioned above, the estimation methodology crucially depends on the availability of a precise measure of the marginal cost. Several industries meet this requirement: the oil refining industry (gasoline, diesel, z-oil, heating oil, naphtha, B-A oil, B-C oil), the paper industry (kraft paper, sanitary paper, woody paper), whiskey, lysine and carbon black. These industries employ simple fixed coefficient production technologies between final products and raw materials, from which we can derive a precise measure of a marginal component.

In addition, these industries have other features favourable to the empirical test in question. They are characterized by a typical oligopoly industry, most of them consisting of three to five firms with the reputation that a collusive interdependence between domestic firms prevailed before foreign entry. This characteristic makes them good candidates for the test of the hypothesis. Secondly, there are few structural changes other than foreign acquisition over the sample period, which enables us safely to ascribe the change in market behaviour, if any, to foreign acquisition. On the other hand, the existence of a recession period following the economic crisis could raise a doubt over the results, since the degree of collusion may increase in the recession period (Cowling, 1982). In an attempt to control for the likely effect of the recession period on market competition, I exclude the severe recession period from the sample period, obtaining qualitatively similar results.

In contrast to the popular belief, the results do not support the hypothesis that foreign entry introduces more competitive pressure on the industry. It is in rather isolated cases of some products that foreign acquisition produces more competitive behavior. The findings from other products suggest that foreign acquisitions are either irrelevant to market competition or even worsen it. Applying the same methodology, I also investigate the impact of deregulation in the oil industry to find that the deregulation was largely successful in increasing market competition. In an attempt to check the predictive power of the methodology, I test the impact of deregulation in the LPG industry, where the deregulation was already known to have had no significant effect on pricing behaviour. The simple experiment shows that the predictive power is quite satisfactory.

The rest of this chapter is organized as follows. Section 2 reviews previous studies. Section 3 constructs the theoretical and empirical model. Section 4 explains the data and the industry background. Section 5 presents the results of estimation, and Section 6 concludes.

2.2 Review of previous literature

While numerous researchers focus on the effect of FDI on host industry productivity, few studies pay attention to its effect on market competition. To the best of my knowledge, there are three studies (Caves, 1974, Chung, 2001, and Co, 2001) which examine the effect of FDI on market competition empirically. These studies employ the traditional SCP paradigm that links market concentration with supra-competitive profits, and implicitly with higher prices. Hence, they examine a statistical relationship between foreign firms' presence (measured by the market share of FDI firms or magnitude of FDI inflows) and industry profits, where a decline in profits suggests an increase in market competition due to FDI inflows.

The first empirical attempt is a study by Caves (1974). If FDI increases market competition, the profits of domestic firms should decrease. Hence, he hypothesizes that a larger presence of foreign firms should correspond to lower profits earned by domestic firms. Using Canadian manufacturing industries, he finds that average profits of domestic firms are lower where FDI firms account for a greater market share.

Chung (2001) stresses that FDI inflows are heterogeneous in terms of entry mode, relative size, and location. Therefore, in contrast to Caves, he explicitly considers the effect of FDI entry mode, even though the control is not complete, hypothesizing that the greater the portion of greenfield FDI is, the more industry profits will decrease. Examining US manufacturing industries between 1987 and 1991, he finds that increases in foreign presence significantly decrease the industry profits, which is consistent with Caves' findings. However, the result shows that entry mode is not significant, although the sign is the same as expected.

Co (2001) investigates the US margins effect of imports and FDI, incorporating FDI into the imports-as-market discipline literature. She also recognizes the difference between greenfield FDI and M&A FDI, although the control for heterogeneity is still not sufficient. M&A effects appear with a lag. The results for greenfield FDI indicate that the effect depends on concentration levels. greenfield FDI is found to increase the margins of industries with low levels of concentration, while, beyond a certain critical concentration level, the competitive effect of FDI predominates (margins decline).

The main shortcomings of the previous studies arise from the fact that they adopt the traditional SCP paradigm. This paradigm argues that structure affects conduct which, in turn, determines economic performance (Bain, 1951). The key hypothesis is that, as high seller concentration facilitates collusion, highly concentrated industry experiences on average supra-competitive profits. Since Bain's seminal paper, a huge number of studies have employed this approach to test the relationship between structure and performance (see Schmalensee, 1989).

This paradigm, however, is subject to a number of criticisms. First, the SCP approach is intrinsically a cross-sectional study, assuming that inter-industry variations can be captured by a small number of observable measures. However, as the NEIO approach argues, individual industries have important idiosyncracies which are not controlled enough in inter-industry studies (Bresnahan, 1989). To the extent that this argument holds, the estimates are in question. Second, the SCP paradigm is not free from measurement errors, especially in the measurement of profits. A number of studies point out the problem in using accounting data. As the NEIO approach emphasizes, the dependent variable, price-cost margin, cannot be taken to be observable, since economic marginal cost cannot be directly or straightforwardly observed (Bresnahan, 1989). Another well-known weakness is that the SCP studies omit important variables, such as the price elasticity of demand. Cowling and Waterson (1976) show that profit-revenue ratio is related directly to the Herfindahl index and inversely to the industry price elasticity of demand, which is typically left out of inter-industry structure-performance regressions because of the non-availability of good measures of it (Katics and Petersen, 1994).

The basic idea of this study is similar to the approach by Sumner (1981), who attempts to measure the level of competitiveness from the response of prices to marginal costs. Since no direct measurement of costs is normally available, the response of prices to marginal cost factors cannot identify the level of market power. He exploits variations in marginal costs due to varying levels of state taxes in the US cigarette industry. Then he infers from the response of prices to marginal costs the

elasticity of demand to proxy the level of market power. His results reject the existence of both perfect competition and an effective cartel in the industry.

However, his methodology has some limitations. As Bulow and Pfleiderer (1983) show, the one-to-one relationship between the elasticity of demand and the response of prices to marginal costs only holds where the demand elasticity is constant. If this is not the case, then the elasticity of demand cannot be inferred from the response of prices to marginal costs. Another point is that he attempts to identify the demand of elasticity based on monopoly competition, and proxies the level of market power from it. Speaking in the language of NEIO, it is the same as if he sets the level of market power to monopoly first, and then attempts to identify the demand elasticity. In this respect, Genesove and Mullin (1998) provide a more developed formulation based on a very general form of demand function. Following the standard NEIO approach, they allow the conduct parameter as a free parameter.

2.3 The model

This study incorporates Sumner's idea within the standard NEIO paradigm to avoid the limitations of both the SCP paradigm and Sumner's approach mentioned in the previous section. As Bresnahan (1989) points out, NEIO studies take views which are distinct from traditional SCP studies in several aspects. First, NEIO assumes that price-cost margins, more precisely marginal costs, are not obtainable directly from accounting data. Typical NEIO studies measure the level of competitiveness without measuring marginal costs directly. In this respect, the NEIO

approach differs from the SCP paradigm completely. Second, individual industries are assumed to have their own unusual features, which are not to be controlled by a small number of observable variables. Accordingly a typical NEIO study employs an econometric model of an industry or very closely related markets. Lastly, NEIO studies attempt to model and directly estimate firms' behaviour. Firms' conduct is measured from the supply equation built on profit maximization.

On the other hand, Sumner's approach shares the same viewpoints on these points with a standard NEIO approach: his model does not need price-cost margins; he focuses on a single industry; and he constructs a pricing equation and attempts to estimate firms' behaviour through a single parameter. However, they depart from each other in dealing with the identification problem. Sumner's methodology crucially depends on a direct measure of costs, while a standard NEIO approach assumes a constant marginal cost or requires an exogenous variable to rotate the demand curve. Another difference is that Sumner attempts to proxy market power through the elasticity of demand, in contrast to the NEIO approach which measures it through a conduct parameter.

There are several questions which can be raised relating to the NEIO methodology, including Sumner's method. The first one concerns the specification of the demand function. A typical NEIO study employs a linear or a log-linear demand function. However, if all the underlying structural equations are not correctly specified, as Hyde and Perloff (1995) argue, the inference about market competitiveness may be problematic. Their simulation results suggest that NEIO estimates are sensitive to specifications. In response to this criticism, Genesove and

Mullin (1998) show that the NEIO estimate is satisfactorily robust irrespective of demand specifications, supporting the use of the NEIO approach. However, as they admit, while for small values of the conduct parameter, the demand specification does not affect the estimation significantly, results can still be sensitive to the assumed demand specification for larger values of the conduct parameter. Furthermore, Sumner's approach identifying the conduct parameter through the response of prices to marginal costs clearly depends on the demand specification. The problem is that we do not know which specification is correct *a priori*.

To deal with this problem, I employ a very general form of demand function set in Genesove and Mullin (1998), which can incorporate, as a special case, the linear, the log-linear and the quadratic demand as well as the exponential demand function. The introduction of a general form of demand function is possible since this study is only interested in identifying relative changes between two periods in market competitiveness rather than estimating absolute levels of two periods. The focus on relative changes is partially motivated by the criticism that it is difficult to interpret what an absolute value of conduct parameter means, except for monopoly and perfect competition.

Second, as Bresnahan (1982) and Lau (1982) show, identification problems can arise. The conduct parameter cannot be identified in some specifications of the demand function. To put it in Bresnahan's language, if a demand function does not rotate and shift as exogenous variables change in a linear specification, the index of competitiveness cannot be identified. Concerning the identification problem, this study assumes a constant marginal cost function and utilizes a direct measure of the

cost function.[1] Certainly, the plausibility of this assumption and the information on costs crucially depends on the nature of the industries in question. Given the nature of fixed-coefficient production technology in the industries in the study, it is not very restrictive to impose the assumption of a constant marginal cost. In addition, the partial information on marginal costs derived from the simple production technology enables us to determine which demand specification is more appropriate.

2.3.1 The Basic framework of NEIO

To show the basic framework of NEIO, I take an industry-level approach. Suppose an oligopolistic market of several firms producing a homogeneous product. We can write the industry inverse demand function as

$$(2.1)\quad P = P(Q; Z)$$

where P is price, Q is total industry output and Z is a vector of variables to shift the demand curve.

The marginal revenue curve can be derived from equation (2.1) by taking the derivative of (2.1) with respect to output.

$$(2.2)\quad MR = P + (1+\lambda)\frac{\partial P}{\partial Q}Q = P + \theta\frac{\partial P}{\partial Q}Q$$

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[1] There are several ways to identify the conduct parameter without adding an exogenous variable to rotate the demand curve. The most common method is to assume a constant marginal cost function. Another alternative is to use comparative statics in cost. Lastly, a direct measure of the cost function can also solve the identification problem.

where $\partial P / \partial Q$ is the slope of the demand curve, and θ is a conduct parameter to index the competitiveness of an industry[2].

With the introduction of the profit maximizing assumption, the equilibrium occurs where its marginal revenue is equal to its marginal cost,

$$(2.3)\ MR = P + \theta \frac{\partial P}{\partial Q} Q = MC$$

where MC is a marginal cost which can be a function of the input variables.

Rearranging (2.3) with respect to P gives

$$(2.4)\ P = MC - \theta \frac{\partial P}{\partial Q} Q$$

The interpretation of the conduct parameter, θ, is as follows: if θ = 0, the market is perfectly competitive since marginal revenue equals price; if θ = 1, the market plays monopoly; if 0 < θ < 1, the market competes between monopoly and perfect competition; if θ = 1/N, firms play an N-firm Cournot game.[3] A typical NEIO study estimates a system of equation (2.1) and (2.4), which yields an estimate of θ with other parameters in the demand and cost function, under the assumption that they are all separately identified.

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[2] Iwata (1974) and many others view this conduct parameter as the conjectural variation: that is, firms' conjectures about the reaction of rivals to an increase in their supply.

[3] With a firm level approach, the interpretation of the conduct parameter varies. The pricing equation is given as $p = mc_i - \theta_i \frac{\partial P}{\partial Q} q_i$, where mc_i is firm i's marginal cost, θ_i is firm i's conduct parameter, $\partial P / \partial Q$ is the first derivative of the industry demand function, and qi is firm i's quantity. $\theta_i = 0$ means perfect competition, $\theta_i = 1$ implies Cournot competition, and $\theta_i = N$ indicates perfect collusion.

It should be noted that the conduct parameter measures "the degree of competition", while the Lerner Index measures "the degree of market (or oligopoly) power" (Appelbaum, 1982; Genesove and Mullin, 1998). Rewriting (2.4) in terms of the elasticity of demand gives

$$(2.5)\ \theta = \eta \frac{(P - MC)}{P} \equiv \eta * L$$

where η is the price elasticity of demand and L is Lerner index. It is obvious that the Lerner index measures the degree of market power. However, it is not sufficient to determine the level of competition since low demand elasticity will tend to yield a high Lerner index and vice versa (Appelbaum, 1982). From (2.5), we can see that the conduct parameter equals the elasticity-adjusted Lerner Index, measuring the level of competition itself.

2.3.2 The empirical model

2.3.2.1. The pricing equation

This study attempts to examine whether foreign acquisition changes the level of market competition. Due to data availability, this study takes an industry-level approach. Following Genesove and Mullin (1998), the demand function is defined as

$$(2.6)\ Q = k(\alpha - dP)^{\delta}$$

where Q is industry demand, P is price and d is an indicator variable taking a value of -1 if the log-linear $(\alpha = 0, \delta < 0)$ and 1 otherwise.[4] k measures the size of market demand, and an increase in k rotates the demand function anticlockwise, increasing demand at any price by the same proportion. Thus the exogenous shift in the market demand can be reflected in the change of the variable k.[5] α is the maximum willingness to pay, a so-called reservation price. This specification of demand is a kind of general form of demand function in that it can incorporate various functional forms of demand. The demand curve can be quadratic (δ=2), linear (δ=1), log-linear (δ<0, α =0) and exponential (α, δ → ∞, and α/δ constant).[6]

With the demand function as (2.6), the marginal revenue function is given as

$$(2.7)\quad MR = P + \theta \frac{\partial P}{\partial Q} Q = P\left(\frac{\delta + \theta}{\delta}\right) - d\,\frac{\alpha\theta}{\delta}$$

where θ is the conduct parameter. Since this study takes an industry-level approach, θ is viewed as an industry conduct parameter, a weighted average of firm-level conduct parameters, where the aggregation assumption follows Cowling and Waterson (1976).

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[4] This is to exclude the case of raising a negative number to a power, which leads to a complex number of quantities demanded and a positive slope of demand function.

[5] This specification of demand implicitly imposes a restriction on price behaviour. As shown in (2.9), under this specification of demand function, the general price rule is not affected by the size of market demand.

[6] The corresponding functions are given as

Linear	$Q = k(\alpha - P)$
Quadratic	$\ln Q = \ln(k) + 2\ln(\alpha - P)$
Log-linear	$\ln Q = \ln(k) + \delta \ln(P)$
Exponential	$\ln Q = \ln(k) + (\delta / \alpha)P$.

With the profit maximizing assumption, the equilibrium occurs where marginal revenue is equal to its marginal cost,

$$(2.8)\ MR = P(\frac{\delta+\theta}{\delta}) - d\frac{\alpha\theta}{\delta} = MC$$

where MC is a marginal cost function.

Rearranging (2.8) with regard to price gives the general price rule (or pricing equation)

$$(2.9)\ P(MC) = d\frac{\theta\alpha}{\delta+\theta} + \frac{\delta}{\delta+\theta}MC$$

We now introduce two standard assumptions. First, the index of convexity in the demand curve, δ, is assumed to be constant over time. In other words, the shape of the demand curve does not vary over time. Note that this does not impose a specific functional form for the demand curve. The specification (2.6) is a general form of demand function, including the quadratic demand curve (δ=2), the linear (δ=1), and the log-linear (α = 0, δ<0) and the exponential (α, δ $\rightarrow\infty$ and α/δ constant). Therefore, this assumption is much less restrictive compared to the popular one of a linear demand or log-linear demand curve. Second, the conduct parameter is time invariant at least for a certain period of time, which is a standard practice in NEIO studies. Given that the level of competition could vary over time, this assumption is restrictive. If this assumption is not acceptable, however, the conduct parameter is viewed as measuring average competition over a certain period of time (Bresnahan, 1989). That is, as Genesove and Mullin (1998) point out, where behaviour oscillated between perfect competition and monopoly, the conduct parameter measures the average level of market power at 0.50. In addition, it might be the case that it takes

time for MNCs to act competitively after their entry.[7] They may take a cautious course until they get used to local markets. Taking this possibility into account, I perform robustness checks, if applicable, where I compare the average level of competition between two periods, before foreign entry and one or two years after foreign entry.[8]

By these assumptions, we have a stable relationship between price and marginal cost. To put it another way, the ratio in which firms pass changes in marginal cost into prices is constant over time regardless of the output level. This restriction is equivalent to imposing the condition that the ratio of the slope of the demand curve and the slope of the marginal revenue curve is constant, as Burlow and Pfleiderer's (1983) analysis shows.[9] It should be noted that with the two above

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[7] One might argue that it is more preferable to model a conduct parameter that varies with the degree of entry. It should be noted that most sample industries experienced just one foreign acquisition during the sample period. Even where a couple of foreign acquisitions happened, as seen in table 2.3, two incidents were very adjacent in time space. Furthermore, foreign acquisitions were large enough to make competitive impact, if any, as soon as foreign firms entered the industry. Foreign firms acquired one or two large firms in a typical oligopolistic industry with 2 to 5 firms. Furthermore, the industry structure including foreign firms' market share was quite stable over the period after acquisition. These facts together provide reasonable grounds for us not to pursue a model where a conduct parameter varies with the degree of foreign entry.

[8] The robustness checks do not produce results qualitatively different from main findings.

[9] With a general form of demand function, the optimal output level solves

(1) $MR \equiv \theta QP' + P = c \equiv MC$

where P' is the first derivative of the inverse demand function with regard to quantity.

From (1), Bulow and Pfleiderer (1983) obtain an expression (2) for the rate at which price is changed to accommodate changes in marginal cost, where I add the conduct parameter.

$$(2)\ \frac{\partial P}{\partial c} = \frac{\partial P}{\partial Q} / \frac{\partial c}{\partial Q} = \frac{\partial P}{\partial Q} / \frac{\partial MR}{\partial Q} \qquad from\,(1)$$

$$= (\text{slope of demand curve})/(\text{slope of marginal revenue curve})$$

$$= P'/\left[P' + \theta(P' + QP'')\right]$$

$$= 1/\left[1 + \theta(1 + QP''/P')\right]$$

where P'' is the second derivative of the inverse demand function with regard to quantity. Therefore, if the change in price to the change in marginal cost is constant, it means that the ratio of the slope of the demand curve and the slope of the marginal revenue curve is constant. Also it is equivalent to say $QP''/P' = k, where\ k$ is a constant with the conduct parameter being constant.

assumptions imposed, the demand function specified in (2.6) always ensures a constant relationship between marginal costs and price.[10]

This conclusion is useful for assessing the effect of foreign acquisition on market competition. If foreign entry affects market competition, the conduct parameter (θ) will vary after foreign acquisition. Therefore, the ratio in the period following foreign acquisition, [δ / (δ +θ_1)], will be different from the one in the previous period, [δ / (δ +θ_0)]. The intuition is that, for a given increase in marginal cost, the magnitude of price change will vary due to the change in competition intensity. On the other hand, it is obvious that if foreign acquisition does not make any difference in market competition, i.e. $\theta_0 = \theta_1$, then the ratio remains the same, [δ / (δ + θ_0)] = [δ / (δ + θ_1)].

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[10] It can be shown that the rate at which price is changed in response to the change in marginal cost, $\frac{\partial P}{\partial c}$, is constant for the demand function specified as

(3) $Q = k(\alpha - P)^{\delta}$,

the first derivative and second derivative are given as

(4) $P'(Q) = -d(\frac{1}{k})^{\frac{1}{\delta}} \frac{1}{\delta} Q^{\frac{1}{\delta}-1}$ and $P''(Q) = -d(\frac{1}{k})^{\frac{1}{\delta}} \frac{1}{\delta}(\frac{1}{\delta}-1)Q^{\frac{1}{\delta}-2}$

Substituting (4) into (2) gives

(5) $\frac{\partial P}{\partial c} = \frac{\delta}{\delta + \theta}$

With the conduct parameter (θ) and the index of convexity (δ) being constant, $\frac{\partial P}{\partial c}$ is constant. Note that this result remains effective for special cases which the specification (3) includes, such as a linear, quadratic, and log linear demand function. For a linear demand function (δ=1), $\frac{\partial P}{\partial c} = \frac{1}{1+\theta}$. For a quadratic function, $\frac{\partial P}{\partial c} = \frac{2}{2+\theta}$. And for a constant elasticity demand curve (or log-linear demand curve), $\frac{\partial P}{\partial c} = \frac{\eta}{\eta + \theta}$ where η is the demand elasticity. Note that this study excludes the possibility of non-constant $\frac{\partial P}{\partial c}$ by specifying the demand function as (3).

(2.10) $P = d\dfrac{\theta_0 \alpha}{\delta + \theta_0} + \dfrac{\delta}{\delta + \theta_0} MC$, before foreign acquisition

(2.11) $P = d\dfrac{\theta_1 \alpha}{\delta + \theta_1} + \dfrac{\delta}{\delta + \theta_1} MC$, after foreign acquisition

A problem arises when we try to identify whether the change in the ratio means an increase (or decrease) in market competition. The interpretation crucially depends on the demand specification: more precisely, the sign of the convexity index, δ.

(1) In the first place, suppose the convexity index is positive, i.e., $\delta > 0$, which implies that the true demand function could be a linear, quadratic or exponential function. If foreign acquisition improves market competition, i.e., $\theta_1 < \theta_0$, then the ratio varies from $[\delta / (\delta + \theta_0)]$ to $[\delta / (\delta + \theta_1)]$, where $[\delta / (\delta + \theta_1)] > [\delta / (\delta + \theta_0)]$. Note that as market competition increases, firms raise prices more for a given cost increase than before.[11]

(2) Second, consider the case that the convexity index is negative, i.e., $\delta < 0$. For simplicity, consider the log-linear case ($\delta < 0$, $\alpha=0$). Remember that $(-\delta)$ is the price elasticity of demand. With the help of a standard economic theory, we know that $0 > (\delta + \theta)$ at equilibrium.[12] In other words, an oligopolist sets its prices where the price elasticity is larger than the conduct parameter.

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[11] For the simplicity of exposition, consider a linear demand function. The ratio of the increase in prices for a given cost increase is as follows. For monopoly it is a half, while it is n/(n+1) for Cournot competition, and 1 for perfect competition.

[12] At the oligopoly equilibrium, the marginal revenue should be equal to the marginal cost. With simple manipulation, this condition is given as

$$MR = p(1 - \frac{\theta}{\varepsilon}) = MC$$

where ε is the price elasticity and θ is the conduct parameter. Since the marginal cost is positive, the marginal revenue should be positive as well, which requires that the price elasticity should be greater than the conduct parameter, θ.

Therefore, if foreign entry increases market competition, i.e., $\theta_1 < \theta_0$, then the ratio varies from $[\delta / (\delta + \theta_0)]$ to $[\delta / (\delta + \theta_1)]$, where $[\delta / (\delta + \theta_1)] < [\delta / (\delta + \theta_0)]$. As market competition increases, firms raise prices less for a given cost increase than before. Note that this result is contrary to the case of $\delta > 0$.

The problem is that we do not know what specification of demand function or what value of convexity index, δ, is true. Without additional information (or assumptions), therefore, we cannot tell whether the change in the ratio implies an increase or decrease in market competition, although we can easily see whether there is a change in market competition due to foreign entry. To overcome this problem I make use of a direct measure of cost, explained later.

2.3.2.2 The marginal cost function

The specification of the marginal cost function completes the pricing equation. I assume a constant marginal cost as

$$(2.12)\ MC = \beta_0 + \beta_1 Input$$

where Input stands for the price of a main raw material and the β s are parameters. β_0 measures all variable costs other than the raw material and β_1 represents the fixed relationship between the raw material and a final product, which plays an important role in the study. Substituting (2.12) into (2.9) gives

$$(2.13)\ P = d\frac{\theta\alpha}{\delta+\theta} + \frac{\delta}{\delta+\theta}\beta_0 + \frac{\delta}{\delta+\theta}\beta_1 Input\ = \gamma + \varphi Input$$

where $\gamma = d\frac{\theta\alpha}{\delta+\theta} + \frac{\delta}{\delta+\theta}\beta_0$ and $\varphi = \frac{\delta}{\delta+\theta}\beta_1$.

We are interested in assessing the effect of foreign acquisition, that is, whether the conduct parameter (θ) varies between the periods before and after foreign acquisition.[13] Imposing another assumption that the βs are constant over time, in other words, the production technology is constant over time, we can infer the change in the degree of competition from the coefficient on the raw material price. This assumption is not too restrictive given the fact that the industries in question employ simple fixed-coefficient production technologies. In addition, they fall within the group of mature industries where production technologies are expected to be stable over time. Furthermore, the sample period is relatively short.

One might argue that MNCs employ newer, more efficient technology, or that they source from their own, lower cost subsidiaries abroad. The industries in the sample are rather free from those kinds of noises. Due to the nature of simple fixed-coefficient production technology, it is very difficult to enhance productivity without significant investment in production facilities. According to industry experts, little investment in production facilities had been made after foreign acquisition in the sample industries.

As explained earlier, without any information on the sign of the convexity index, δ, we cannot tell whether there is an increase (or decrease) in market competition, even though we know that there is a change in market competition. The

[13] The estimation of equation (2.13) cannot identify the conduct parameter separately, unless both convex index and the parameter, β_1, in the marginal cost function, are known. Genesove and Mullin (1998) deal with this identification problem by utilizing the seasonality in the demand system, more precisely, the maximum willingness to pay, α.

study utilizes a direct measure of β_1 in dealing with this problem. In some industries, the production technology is quite simple in a mechanical sense, providing a precise estimate of the marginal cost coefficient. For instance, in the oil refining industry, there exists fixed-coefficient production technology between crude oil and refined oil products, from which we derive the value of β_1. So we can use the value to determine the sign of the convexity index, δ. Rearranging of the coefficient on raw material price in (2.13) gives

$$(2.14)\quad 0 \le \theta = \frac{\delta(\beta_1 - \varphi)}{\varphi} \le 1$$

I exploit the condition that the conduct parameter should not be negative. And we expect the sign of φ to be positive. If $(\beta_1 - \varphi) < 0$ along with $\varphi > 0$, then δ should be negative. If $(\beta_1 - \varphi) > 0$ along with $\varphi > 0$, then δ should be positive. Now we know the sign of the convexity index, δ, from the regression result, so that we can tell whether foreign acquisition leads to an increase (or decrease) in market competition.[14] To summarize, this approach develops Sumner's (1981) idea in several ways. I extend applicability to a various form of demand functions. Second, I explicitly introduce the conduct parameter to measure the level of market competitiveness. Focusing on relative changes in the response of prices to marginal costs, I can build a model based on a general form of demand function. Lastly, the

[14] As Genesove and Mullin (1998) point out, this approach has a shortcoming that the conduct parameter greatly depends on the demand specification, δ, which we do not know. Since this study is interested in comparing the conduct parameter between periods, not in the absolute value of the conduct parameter, however, this does not create a serious problem.

partial information on marginal cost helps in interpreting the change in market competitiveness between two periods.

2.3.2.3 The estimation equation

To check if there is a change in the conduct parameter between the periods before and after foreign acquisition, I employ a standard dummy variable technique[15], which is similar to Parker and Roller (1997) and Rubinovitz (1993). With the introduction of a dummy variable, we can write the equation (2.13) as

(2.15) $P_t = \gamma_1 + (\gamma_2 - \gamma_1)Dum_t + \varphi_1 Input_t + (\varphi_2 - \varphi_1)Dum_t * Input_t + \varepsilon_t$

where Dum is a value of 1 for period 2, and 0 otherwise. Note that I introduce an intercept dummy variable as well, which is expected to capture various effects arising from changes in the demand and cost as well as in competition. Therefore, I focus on the parameter on Dum*Input. The hypothesis is that the coefficients on Input are the same between the periods: in other words, $H_0; \varphi_1 = \varphi_2$. An insignificant coefficient suggests foreign acquisition does not have a significant effect on market competition.

2.4 Industries and Data

2.4.1 Industries

[15] Chow tests cannot be alternative methods, since they are not able to tell which variable is different.

To test the effect of foreign acquisition on market competition, this study examines several industries which have experienced foreign acquisition after the economic crisis in Korea. Facing a severe credit crunch due to the economic crisis, many Korean conglomerates had to sell off their divisions or companies to foreigners simply to raise cash. As a result, for the first time in Korean economic history, a number of fire sales to foreigners took place. Any of the industries experiencing foreign acquisition could be candidates for the study. As explained in earlier sections, however, the methodology crucially depends on the availability of a precise measure of the marginal cost component.

Several industries meet this requirement: the oil refining industry (gasoline, diesel, z-oil, heating oil, naphtha, B-A oil, B-C oil), the paper industry (kraft paper, sanitary paper, woody paper), whiskey, lysine and carbon black. Table 2.1 outlines foreign acquisitions in these industries, along with other important structural changes such as deregulation. It is not surprising that most foreign acquisitions took place between 1998 and 2000, considering the credit problem Korean firms faced after the economic crisis in Dec 1997.

[Insert Table 2.1 here]

Table 2.1 presents the information relating to a direct measure of the cost component for these industries. Relying on various sources, I identify key materials

and direct measures of cost.[16] They are all mature industries, employing fixed rate production technology between a final product and key materials, from which we can derive a very precise measure of a cost component. Consider the oil industry as an example. Crude oil shipped from the Middle East is, at a fixed rate, processed into various oil products: gasoline, diesel, z-oil, heating oil, naphtha, B-A oil, B-C oil and others. Since a small amount of crude oil is lost during the shipment and refining process, the rate is not one-to-one. According to the Korea Energy Economic Institute, the loss rate is around 3.62 per cent. This means that l litre of crude oil yields 0.9638 litres of refined oil. So l litre of oil product requires 1.0375 litres of crude oil.[17] Therefore, the marginal coefficient on crude oil is 1.0375, which is fixed over time. Kraft paper is a little different from the others, in that two important raw materials are involved. Kraft paper requires waste paper as well as pulp. 1 kg of raw material produces 0.882 kg of kraft paper. In other words, 1kg of kraft paper needs 1.13 kg of raw material, which implies that the direct measure is 1.13.

[Insert Table 2.2 here]

The industries have other features favourable for the empirical test in question. First, they are characterized by a typical oligopoly industry, most of them

[16] A key material for each product is identified with the help of publications by related trade associations or industry experts. Most of the direct cost measures are obtained from industry experts, who provide the information with a condition that I do not disclose the source of the information. The oil industry is one exception since the production relationship is common knowledge.

[17] They do not apply different loss rates across various refining oils, so that I use the same rate for various refined oil products.

consisting of 3 to 5 firms. Accordingly they are highly concentrated industries, having been listed by the Korea Fair Trade Commission as "highly concentrated markets"[18], where one firm accounts for a more than 50 per cent market share or where the top two or three firms combined hold a more than 75 per cent market share. Furthermore, in these industries, collusive interdependence or mutual accommodation seems to have prevailed before foreign firms' entry.[19] This characteristic makes these industries obvious candidates in assessing if foreign firms as newcomers disrupt the prevailing collusive stability among domestic firms. Second, market structure is very stable over the sample period. Most industries have undergone few structural changes except for foreign acquisition over the sample period, so that we can safely ascribe the change in market competition, if any, to foreign acquisition.

The recession period following the economic crisis may affect the behaviour of economic agents significantly, making the interpretation of the change in market competition more complicated. A possible scenario is that in the recession the degree of collusion can rise, as many studies (Cowling, 1982 and others) suggest. The existence of excess capacity during the recession may imply immediate retaliation to anyone's price cutting and thus make all participants more cooperative. If this is the case, then I could not ascribe a change in the ratio only to foreign acquisition. As a

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[18] The Korean Fair Trade Commission had annually listed and monitored highly concentrated markets since 1991 to regulate oligopolistic markets. The listing system, however, was abolished in 2000.

[19] For instance, leading firms in the oil and the paper industry had been heavily punished for price cartels by the Korea Fair Trade Commission.

way to control this source of noises, I drop the recession period from Dec. 1997 to Dec 1998[20], and re-estimate the model.

Among the sample industries, the oil industry experienced another important change in market structure, that is, there was price deregulation. While liberalizing the regulation on oil products gradually, the Korean government had been regulating the price levels of refined oil products until Feb 1998, when it abolished the regulation completely.[21] This implies that all oil products were not subject to a single scheme of price regulation: gasoline, heating oil, diesel, B-A oil, and B-C oil were under control during some early part of the sample period, while Z-oil and naphtha were not at all. Lastly, to test the predictive power of the methodology, I include the LPG industry, which has never received foreign entry.[22] The Korean government liberalized LPG prices in 2001. For the test, I exploit the fact that they did not change the pricing policy at all despite the deregulation.

In the case of oil industry, the existence of deregulation could introduce a difficulty in estimating the effect of foreign firms on price competition. It could be that, while price deregulation increased competition, foreign entries did not. I attempt to disentangle the two effects from each other by introducing two dummy variables,

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[20] In 1998, the Korean economy experienced a minus 7 per cent growth rate, while it quickly bounced back to nearly 10 per cent of annual growth rate the next year.

[21] Although the Korean government abolished existing price regulation and liberalized imports in January 1997, it maintained another regulation to require oil companies to report their increases in prices in advance. Therefore, to examine the effect of regime change in regulation, I separate two periods, before and after Feb, 1998.

[22] Although LPG is one of the refined oil products, I treat LPG as a separate product from others for the reasons explained in the next section.

as seen in (2.16) later.[23] In contrast to the oil industry, the other industries are free from this kind of complexity arising from the existence of deregulation. By putting the results together, therefore, we could draw the picture about foreign firms' roles.

2.4.2 Data

The sample period is from Jan 1993 to Aug 2004, except for whiskey where the sample period is between Jan 1995 and Aug 2004. Table 2.3 summarizes the structure of the sample. The study includes two important variables: final product prices and key material prices. The product and raw material prices are obtained from the Producer Price Index or the Trade Statistics compiled by the Korea Customs Service. All of product prices come from the Producer Price Index, while most of the raw material prices are taken from the Trade Statistics. The Trade Statistics provide both quantities and values of imported goods by the HS (Harmonized Commodity Description and Coding System) code, from which I derive average prices of raw materials on a monthly basis. The price index, from the Producer Price Index, is also satisfactorily specific. The Bank of Korea publishes the price index for more than 800 products as well as for groups of products. A problem is that the Producer Price Index provides only the price index normalized against the average price of 100 in 2000. Using a nominal price obtained from related trade associations or companies, I reconstruct the time series of the nominal prices. Then I deflate each series by the

[23] The existence of recession period leaves a short second period, that is, a small number of observations for the deregulation period before MNCs appear.

general producer price index to obtain the real price series. The study uses monthly data. Table 2.4 and 2.5 present summary statistics for variables of each product.

[Insert Table 2.3 here]

[Insert Table 2.4 here]

[Insert Table 2.5 here]

2.5 The Estimation Results

For all the estimation, following Genesove and Mullin (1998), the error terms are assumed to have heteroskedasticiy and autocorrelation of unknown form. In the presence of heteroskedasticity and autocorrelation, OLS estimators are inefficient and their standard errors are biased. To obtain efficient estimators, this study employs Newey-West method. So the standard errors are autocorrelation and heteroskedasticiy robust.

2.5.1 Oil refining industry

Experiencing a change in regulation regime as well as foreign acquisition over the last ten years, the oil refining industry in Korea can serve as an ideal testing ground to examine the impact of foreign acquisition and deregulation on market competition. The main aim is to assess two issues: whether the deregulation, that is, the abolition of price regulation and the liberalization of imports, leads to an increase

in market competition; and whether foreign acquisition has brought more competitive pressure into the market.[24] Along with this, the study investigates the popular notion that oil companies tend to raise prices more when crude oil prices rise, while they do not lower them enough with crude oil prices falling. Assuming that oil firms maximize their profits product by product, I estimate the model for each product. This is not very restrictive, given that each oil product constitutes a separate market.[25] Note that in the following tables, a variable of Input incorporates energy taxes as well as crude oil prices in order to control for the impact of the varying taxes levied on oil products.[26] Another point to make is that an endogeneity problem does not arise since the Korean oil industry totally depends on crude oil imported from abroad and the demand in Korea is marginal to the world demand.

Table 2.6 examines whether the deregulation increases market competition or not. I present two groups of oil products, where the first five products experienced the deregulation during the sample period and the last two products already underwent deregulation in the 1980s. Although we can expect that there is no significant impact of the deregulation in the second group, I do the same test on the second group to compare it with the first group. Throughout the columns, Dum is a

[24] A fourth firm acquired the fifth company on September 1999, making a 5-firms-industry into a 4-firms-industry. Then on September 2001, it became a 5-firms-industry again, since they were separated due to bankruptcy of the fifth company. I assess the effect of the change in the number of firms, failing to find any significant effect.

[25] Most oil products have different uses, providing a reasonable ground to constitute a separate market for each. For instance, Z oil is used for airplane fuel, while naphtha is a key material for the chemical industries. When it comes to gasoline and diesel, it is not clear. Both of them are used for cars, although they are for different types of cars. Given that the conversion from a gasoline to a diesel car is not common in the short run, I assume separate markets for each.

[26] The Korean government has imposed heavy energy taxes on oil products such as gasoline, diesel, heating oil and LPG (butane). Over the sample period, these taxes have varied to some extent, due to changes in energy policy or tax policy. Especially since 2000, a new energy policy has initiated a sharp tax increase on heating oil, diesel and LPG (butane).

dummy variable with a value being 1 for the period after the deregulation (Feb 1998 to Aug 2004) and 0 otherwise. A significant coefficient on the interaction term of Dum and Input implies a significant difference in pricing behaviour between the two periods, supporting the hypothesis that deregulation has an impact on market competition.

[Insert Table 2.6. here]

As explained earlier, the interpretation depends on the demand specification, more precisely, on the sign of the convexity index, δ, which we do not know. Based on the relationship (2.14), I determine the sign of convexity index for each product with the help of partial information on marginal costs. The procedure is as follows. The first step is to estimate the pricing equation without dummy variables using the whole sample period. The use of the whole sample period without dummy variables assumes that the sign of convexity index does not vary over the sample period. The second step is to compare the estimated parameter φ with β_1 obtained extraneously from industry experts. From the relationship (2.14), if the parameter φ is larger than β_1, it implies that the convexity index should be negative. On the other hand, if the parameter φ is smaller than β_1, the convexity index should be positive. To compare them, I conduct a simple t-test. Consider the case of gasoline. I estimate the pricing equation for gasoline without dummy variables, using the whole sample. I set up a hypothesis that $\beta_1 > \varphi$. Since β_1 is 1.0375 in the oil industry, the hypothesis is that $1.0375 > \varphi$. Then we conduct simple hypothesis testing. The t-ratio is 4.63, rejecting

the hypothesis at the 1% level. According to the relationship (2.14), this result implies a negative convexity index. Note that I do not report the results of estimation without dummy variables.

In passing, the extraneous estimates of β_1 play a key role in deciding the sign of the convexity index. Considering the nature of production technologies employed in the sample industries and the data sources, the estimates are relatively reliable. In addition, the sign of the convexity index greatly depends on the difference between the extraneous estimate of β_1 and the regression estimates of φ. With the regression results, the differences are considerably large or small enough to make safe inferences on the sign of the convexity index.

All coefficients of interest in the first five columns are negative and significant except gasoline, suggesting that the deregulation brings more competitive behaviour into the oil industry. In contrast, the last two columns of Naphtha and Z oil report insignificant coefficients, as expected. In other words, there exists no significant difference between the two periods before and after Feb 1998. This sharp contrast between the two groups of products strengthens the conclusion that the deregulation has a significant impact on price competition.

As mentioned earlier, one might argue that the economic crisis itself could have disrupted the constant relationship between prices and marginal costs by affecting the behaviour of economic agents. If this is the case, we could not ascribe a change in market competition, if any, only to foreign acquisition. To separate the possible effect of the shock on market competitiveness, I drop observations which

belong to the recession period from Dec 1997 to the end of 1998, when the Korean economy plunged following the shock.

Table 2.7 shows the results. The competitive effect of the deregulation is less apparent compared to Table 2.6, although a largely similar pattern remains. In the case of gasoline and heating oil, the deregulation is irrelevant to price competition or brings more cooperative pricing behaviour. Except for these points, the results are the same as Table 2.6. A point to note is that the exclusion of the recession period significantly increases the goodness of fit across columns, suggesting there was some deviation from the average during the recession.

[Insert Table 2.7 here]

Table 2.8 refers to the issue of the impact of foreign acquisition. The sample period is between Jan 1993 to Aug 2004, which I split into three sub-periods according to regulation regime and foreign acquisition: regulated period, deregulated period before foreign acquisition, and deregulated period after foreign acquisition.[27] I introduce two dummy variables to compare the level of market competition among three periods, where I use the second period as a base period. [28] Then I re-specify the model as

[27] Since two foreign acquisitions are very close in time space, I use the second foreign acquisition in constructing sub-periods.

[28] Using a short sample period from Feb 1998 to Aug 2004, I also did a test. The result mainly remains unchanged.

$$(2.16)\quad P_t = \gamma_1 + (\gamma_2 - \gamma_1)Dum1_t + (\gamma_3 - \gamma_1)Dum2_t + \varphi_1 Input_t + (\varphi_2 - \varphi_1)Dum1_t * Input_t + (\varphi_3 - \varphi_1)Dum2_t * Input_t + \varepsilon_t$$

where Dum1 is 1 for the first sub-period, Dum2 is 1 for the third sub-period, and 0 for the second period. The coefficient on Dum1*Input measures the impact of deregulation, while that on Dum2*Input measures the effect of foreign acquisition.

The results are mixed. For Naphtha and Z oil, foreign entry increases price competition, while for the others foreign firms have few significant effects or even worsen it. Note that Naphtha and Z oil have a positive convex index so that a positive coefficient implies an increase in price competition.[29] Dropping the recession period provides qualitatively similar results, as seen in Table 2.9, where foreign firms have no significant effect on the first five products, with significant impact on Naphtha and Z oil. The results in Table 2.9 seem more reliable in two aspects: the goodness of fit improves across columns; and the coefficient on input prices becomes significant in the case of gasoline and diesel.

[Insert Table 2.8 here]

[Insert Table 2.9 here]

Table 2.10 examines the common belief that oil companies increase prices more when crude oil prices rise, while they are reluctant to lower prices when crude oil prices are falling. I construct two sub-periods depending on crude oil prices. Dum

[29] For these two products, there should be only two sub-periods; the period before and after foreign acquisition. Applying one dummy variable also produces the same results.

is a dummy variable with its value being 1 when crude oil prices rise, and 0 otherwise. The coefficient on Dum*Input measures the difference between the two periods. The results are consistent across columns, that pricing behaviour is not different between the two periods. As shown in Table 2.11, excluding the recession period produces a qualitatively similar pattern, which does not support the popular belief. When crude oil prices rise, the pricing pattern does not vary in most products. Only the pricing of heating oil shows as less competitive, but the estimate suggests a very small fraction of price increase, if any.

[Insert Table 2.10 here]

[Insert Table 2.11 here]

To summarize, the deregulation is largely successful in increasing market competitiveness in some oil products, while foreign acquisition does not manage to raise market competitiveness, except for two products. And the pricing pattern does not support the popular belief that oil companies increase price more when crude oil prices rise.

2.5.2 Paper industry

The paper industry is one of the largest FDI recipient industries after the economic crisis in Korea. Despite several foreign acquisitions, we could see variations in foreign presence among paper products because there are various types

of paper in the industry and no firms cover the entire range of paper products. This provides a chance to compare the results with those for other papers which have not experienced foreign acquisition. To see the impact of foreign acquisition, I look at sanitary paper, Kraft paper and woody paper among many candidates. Along with this, I estimate the model for woody-free paper and art paper as well, which have not been subject to foreign acquisition.

In Table 2.12, the first three columns examine the difference in pricing behaviour between the two periods before and after foreign acquisition. A significant coefficient on the interaction term of Dum and Input implies significant difference in pricing behaviour between the two periods. Since the interpretation crucially depends on the demand specification, more precisely, the sign of the convexity index, δ, I determine the sign for each product with the help of direct measures of cost. I conduct hypothesis testing. The null hypothesis is $\delta > 0$, that is, $\beta_1 > \varphi$, where β_1 is a direct measure of cost for each product and φ is an estimate of the response of prices to marginal costs. The second set of rows presents the results of the test. For all three products, the sign of the convex index is positive. With a positive convex index, a negative coefficient on the interaction term indicates less competitive pricing behaviour.

The first three columns present significant and negative coefficients, suggesting that foreign acquisition brings more cooperation between firms. The last two columns refer to the results relating to other papers which have not experienced foreign acquisition. The same dummy variable as the one in the third column is

introduced, considering that they all belong to the category of printing paper.[30] *A priori* we expect insignificant coefficients on Dum*Input since they were not subject to foreign acquisition. However, the result is unexpectedly very similar to those for the first set of paper, strongly suggesting deterioration in market competition. A likely explanation is that foreign acquisition has brought more cooperation in the sector of woody free paper and art paper as well since they belong to a market in a broad sense. Table 2.13 presents the results for a sub-sample which excludes the recession period. The pattern of results does not vary.

To put together these results, we can conclude that foreign acquisition in the paper industry worsens market competition, contrary to the popular belief that foreign entry brings more competitive behaviour into the market. Note that a traditional endogeneity problem does not arise since paper companies greatly depend on pulp imported from abroad and the demand in Korea is marginal to the world demand.

[Insert Table 2.12 here]

[Insert Table 2.13 here]

2.5.3 Other industries

[30] Roughly speaking, paper is categorized into four groups of paper: newsprint, sanitary paper, printing paper, and board paper. The printing paper includes woody paper, woody-free paper and art (or coated) paper. Woody paper is low quality paper, used for notebooks, while woody-free paper is high quality printing paper used for printing books. Art paper is different from woody-free paper in that it is coated.

Although there are many other industries where foreign firms have succeeded in take-overs of Korean firms, data limitation restricts the empirical estimation to several industries, such as whiskey, lysine and carbon black. They share a characteristic in common, that foreign firms are dominant players in the market. Combined together, they account for more than two-thirds of the market. Since foreign acquisition took place in different times for each industry, Dum represents a different series for each product. The whiskey industry experienced two foreign acquisitions, which were apart in time, so that I estimate the model using both incidents. On the other hand, in the case of carbon black, I estimate the model only using the second acquisition, since they happened at nearly the same time.

Tables 2.14 and 2.15 present the results, where Table 2.14 employs the whole sample period while Table 2.15 excludes the recession period. In each table, the first two columns refer to the results for whiskey. The first foreign acquisition has no significant effect on market competition, while the second foreign acquisition is found to worsen it significantly. In the case of lysine and carbon black, the two tables provide different explanations. Because the exclusion of the depression period increases the goodness of fit substantially, I concentrated on the second table. In the case of lysine, foreign acquisition leads to worsened market competition. Although foreign firms are dominating the market like in the other two industries, the carbon black industry is found to have experienced a significant increase in market competitiveness, supporting the common belief.

[Insert Table 2.14. here]

[Insert Table 2.15. here]

2.5.4 LPG (Liquefied Petroleum Gas) industry

This section investigates the predicting power of the methodology proposed in the study, employing the prior information on the competitive level in the LPG industry. There are two types of LPG, Butane and Propane.[31] Although they are produced in the processing of refining crude oil, LPG is different from other oil products in several aspects. First, the LPG industry is practically a duopoly, in contrast to a 5-firms industry for other oil products. Since the production of LPG is not sufficient to cover the domestic demand, the import of LPG is inevitable. Two LPG companies involved in the import of LPG account for nearly 80 per cent of the market with their subsidiary oil companies. And LPG was subject to a different regulation regime from other oil products, a regime which remained effective for three more years even after the regulation for oil products was abolished. The price of LPG was finally liberalized in Jan 2001. However, firms did not change their pricing pattern at all. Finding that they stuck to the old pricing formula of the regulation regime which was identical between two firms, the Korea Fair Trade Commission imposed a considerable amount of surcharges against their *de facto* price fixing.

[31] Butane is used for LPG cars, while Propane is mainly for domestic and industry heating fuel. The different uses of LPG provide reasonable grounds to define a separate market for each. Therefore, I estimate the model for each LPG.

Tables 2.16 and 2.17 look at whether there is any change in market competition between periods before and after the deregulation, where Table 2.16 uses all observations in the sample, while Table 2.17 drops the recession period. As expected from the prior information, the deregulation does not make any difference in firms' pricing policies. The first and second column for each product examine the impact of the deregulation, where the first columns employ the sub-sample period of Jan 1993 to June 2002 and the second ones extend the period to the whole sample period of Jan 1993 to Aug 2004. Since the FTC decision deals with the period of Jan 2001 to Jun 2002, the use of the sub-sample period is a simple way to exclude the likely impact of the FTC investigation from the estimation. The parameters on Dum*Input are found to be insignificant in both products, which is consistent with the prior information that they stuck to the old regime of pricing policies with no change.[32] Therefore, it can be said that although it is very simple, this methodology seems to capture very well whether there is change in market competition or not.

The third column for each product refers to the effect of the FTC decision on market competition. Since the FTC decision was officially made in Dec 2002, I define a dummy variable whose value is 1 for the period of Dec 2002 to Aug 2004 and 0 otherwise.[33] The hypothesis that the convex index is positive is rejected at 1 percent level for both products. The parameter of interest is negative and significant in the case of Butane, indicating that the FTC decision was successful in making

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[32] Like the oil industry, a variable of Input incorporates energy taxes as well as crude oil prices in order to control for the impact of varying taxes levied on oil products.

[33] I estimate the model using a dummy variable whose value is 1 for July 2002 to Aug 2004 and 0 otherwise. The estimation result is very similar to the above.

firms adopt more competitive pricing policies. Excluding the recession period does not make any qualitative difference except that the FTC decision is marginally successful in lowering the prices of propane as well.

[Insert Table 2.16 here]

[Insert Table 2.17 here]

2.6 Conclusion

Using the Korean experience, this study has investigated the effect of foreign acquisition on market competition. The estimation strategy is to infer the level of market competitiveness from the response of prices to marginal costs. The basic idea is similar to Sumner's approach, which is subject to some limitations, as mentioned earlier: he attempts to proxy the level of market power from the elasticity of demand; the estimation results vary according to the specification of demand, which we cannot know *a priori*. In avoiding them, this study incorporates Sumner's idea within the NEIO paradigm to introduce a conduct parameter. Focusing on relative changes in market competition, I then construct a pricing equation based on a very general form of demand function. This feature distinguishes this study from a standard NEIO study which typically assumes a log-linear or linear demand function. The next step is to compare the conduct parameter between two periods before and after foreign acquisition. As explained, a problem arises from the fact that the interpretation depends on the sign of the convexity index. The partial information about marginal

costs solves the problem by allowing the data to determine which one is more compatible with the results.

Since the empirical methodology relies on the availability of a precise measure of the marginal cost component, I have chosen several industries where we can obtain a direct measure of cost components from their simple fixed ratio production technologies between final products and raw materials. The list includes the oil industry (gasoline, diesel, z-oil, heating oil, naphtha, B-A oil, B-C oil), the paper industry (kraft paper, sanitary paper, woody paper), whiskey, lysine and carbon black. These industries have other features favourable for the empirical test. They are all highly concentrated industries, having undergone few structural changes except for foreign acquisition over the recent years. Hence we can safely ascribe the change in market behaviour, if any, to foreign acquisition. The existence of a recession period just following the economic crisis could make the interpretation complicated, since the degree of collusion may increase in the recession period. In controlling the likely effect of the recession period on market competition, I exclude the recession period from the sample period, obtaining qualitatively similar results.

Contrary to the common belief, the results do not support the hypothesis that foreign entry introduces competitive pressure on domestic firms. It seems that mostly in isolated cases foreign acquisition increases price competition: in the sector of naphtha, z oil and carbon black foreign acquisition does bring in competitive pressure into the market. The results from other products suggest that foreign acquisition is irrelevant to market competition or even reduces price competition. I also investigate the impact of deregulation in the oil industry, finding that it was

largely successful in increasing market competitiveness. A simple test on the LPG industry shows that the predictive power of this methodology is quite satisfactory. Given that the data requirement is modest, this methodology can be a useful tool for the detection of change in market competition in homogenous product industries, especially where partial information about the marginal cost is available. A possible extension would be to estimate a system of demand and pricing equation, employing a standard NEIO approach. The comparison between two sets of results would help to check how good the methodology of this study is. Certainly, the extension would greatly depend on the availability of quantity data.

Appendix

Table 2.1. Key dates in the history of each industry

Industry	Date	Event
Oil	Feb 1998	The Korea government abolished price regulation completely for gasoline, diesel, heating oil, B-A oil and B-C oil
	Sep 1999	Hyundai Oil Bank acquired Inchon Oil Refinery, making a 5-firm into a 4-firm industry
	Oct 1999	IPIC (UAE) acquired 50 % of shares in Hyundai Oil Bank, to exercise co-management
	Nov 1999	Aramco (Saudi) acquired S-Oil
	Sep 2001	Inchon Oil Refinery went bankrupt to be under the control of the court, making again a 5-firm industry.
LPG	Jan 2001	The Korea government liberalized LPG prices.
	Dec 2002	Korea Fair Trade Commission imposed a large amount of surcharges against price fixing
Kraft paper and sanitary paper	Dec 1997	P&G (US) acquired Ssangyong Paper, which produced Kraft paper, sanitary paper, and Nappies.
Printing paper	Dec 1998	Delphinium Enterprise Pte Ltd (Norway+Canada) acquired the printing paper division from Hansol Paper.
Whiskey	Jun 1998	Seagram (Canada) acquired Dusan Seagram
	Oct 1999	Allied Domecq PLS (UK) acquired the division of whiskey from Jinro Ltd.
Lysine	Mar 1998	Basf (Germany) acquired the division of lysine from Daesang
Carbonblack	Nov 1998	Degussa A.G (Germany) acquired Korea Carbon Black
	Dec 1998	Columbian Chemical (US) acquired the division of carbon black from Keumho

Table 2.2. Direct measures of cost

Industry	Key material	Direct measure of cost
Oil products	Crude oil	- A litre of crude oil produces 0.9638 litres of refined oil. In other words, 1 litre of oil products requires 1.0375 litres of crude oil. - Therefore, the direct measure of cost is 1.0375
LPG	Imported LPG	- A litre of imported LPG means a litre of LPG since imported LPG is sold without additional processing - The direct measure of cost is 1
Sanitary paper	Pulp	- 1 kg of pulp (BKP) produces 0.93 kg of sanitary paper. In other words, 1 kg of sanitary paper requires 1.07 kg of pulp. - The direct measure of cost is 1.07.
Kraft paper	Pulp and waste paper	- 40 % of pulp (UKP) and 60 % of waste paper (OCC) is used. And 1 kg of raw material produces 0.882 kg of kraft. In other words, 1 kg of kraft needs 1.13 kg of raw material. - The direct measure of cost is 1.13.
Printing paper	Pulp	- 1 kg of pulp (BKP) produces 1.2 kg of printing paper. In other words, 1 kg of printing paper needs 0.833 kg of pulp - The direct measure of cost is 0.833
Whiskey	Undiluted Scotch whiskey	- 1 litre of undiluted whiskey produces 1.425 litres of whiskey. In other words, 1 litre of whiskey requires 0.70 litres of undiluted whiskey. - The direct measure of cost is 0.70.
Lysine	Raw sugar	- 1 kg of raw sugar produces 0.70 kg of lysine. In other words, 1 kg of lysine needs 1.428 kg of raw sugar. - The direct measure of cost is 1.428.
Carbon black	FCC oil	- 1kg of FCC oil produces 0.20-0.50kg of carbon black. In other words, 1kg of carbon black needs 2-5kg of FCC oil. - The direct measure of cost is 2.0-5.0.

* In the case of oil products and LPG, the energy taxes are not explained here
Source: The Korea Energy Economic Institute and anonymous others.

Table 2.3 The structure of the sample

	Oil industry	Kraft	Sanitary paper	Printing paper	Whiskey	Lysine	Carbonblack
Sample period	Jan 1993 – Aug 2004	Jan 1993 – Aug 2004	Jan 1993 – Aug 2004	Jan 1993 – Aug 2004	Jan 1995 – Aug 2004	Jan 1993 – Aug 2004	Jan 1993 – Aug 2004
The level of Data	Industry Level	Industry Level	Industry Level	Industry Level	Industry Level	Industry Level	Industry Level
Data Frequency	Monthly data	Monthly data	Monthly data	Monthly data	Monthly data	Monthly data	Monthly data
No. of Obs	140	140	140	140	116	140	140
Foreign Entry							
- How many	2 firms	1 firm	1 firm	1 firm	2 firms	1 firms	2 firms
- When	Oct 1999 Nov 1999	Dec 1997	Dec 1997	Dec 1998	Jun 1998 Oct 1999	Mar 1998	Nov 1998 Dec 1998
- How big (market share)	21%	44%	27%	50%	68%	70%	70%
Other structural change	Price Deregulation	None	None	None	None	None	None
- When	Feb 1998	-	-	-	-	-	-
Data Sources	Korea National Oil Corporation	Korea Paper Manufacturers' Association	Korea Paper Manufacturers' Association	Korea Paper Manufacturers' Association	Hite Corporation	CJ Corporation	Kumho Petrochemical

Table 2.4. Descriptive Statistics of the data (1)

	Whole Sample				Subsample1 (before foreign entry)				Subsample2 (after foreign entry)			
	Mean	Std.Dev	Min	Max	Mean	Std.Dev	Min	Max	Mean	Std.Dev	Min	Max
Gasoline price	1043.8	251.7	684.8	1348.6	864.6	186.3	644.8	1210.6	1282.7	36.02	1188.7	1348.6
Input price	755.7	206.4	437.6	997.8	610.6	158.1	437.6	922.4	949.1	19.6	897.9	997.8
No of Obs.	140				80				60			
Heating oil price	482.9	141.0	296.5	775.2	385.3	90.8	296.5	760.9	613.0	75.5	474.0	775.2
Input price	337.1	48.1	252.9	450.1	167.4	36.3	113.7	274.2	337.1	48.1	252.9	450.1
No of Obs.	140				80				60			
Diesel price	513.2	208.7	255.0	899.1	360.1	114.4	255.0	729.0	717.4	104.6	545.0	899.1
Input price	160.7	55.1	86.6	277.7	117.4	20.1	86.6	193.3	218.5	25.8	162.3	277.7
No of Obs.	140				80				60			
Bcoil price	249.9	89.4	114.3	437.2	187.8	65.5	114.3	437.2	332.8	29.4	252.0	393.6
Input price	160.7	55.1	86.6	277.2	117.4	20.1	86.6	193.3	218.5	25.8	162.3	277.7
No of Obs.	140				80				60			
Baoil price	295.4	99.7	162.6	547.9	229.3	75.3	162.6	547.9	383.7	44.6	285.7	475.5
Input price	160.7	55.1	86.6	277.7	117.4	20.1	86.6	193.3	218.5	25.8	162.3	277.7
No of Obs.	140				80				60			

* Input price includes energy tax on each product as well as crude oil prices.

Table 2.5. Descriptive Statistics of the data (2)

	Whole Sample				Subsample1 (before foreign entry)				Subsample2 (after foreign entry)			
	Mean	Std.Dev	Min	Max	Mean	Std.Dev	Min	Max	Mean	Std.Dev	Min	Max
Kraft price	575.0	48.1	486.6	670.3	545.7	54.9	486.6	670.3	596.4	27.2	497.2	637.7
Input price	480.4	95.5	331.4	766.2	473.0	123.8	331.4	766.2	485.7	68.3	404.4	756.8
No of Obs.	140				59				81			
Sanitary paper	1933.8	115.2	1691.1	2098.3	1899.8	144.5	1691.1	2098.3	1958.6	80.4	1808.5	2073.7
Input price	594.1	126.2	371.1	942.6	550.1	138.6	371.1	851.3	620.9	107.6	484.6	942.6
No of Obs.	140				59				81			
Writing paper	677.6	68.8	549.8	768.4	608.3	41.3	549.8	681.2	728.0	29.5	605.8	768.4
Input price	537.4	103.9	364.9	853.9	505.2	112.1	364.9	734.1	560.9	91.2	451.0	853.9
No of Obs.	140								60			
Whiskey price	44542	4074	38919	53093	45120	5369	38919	53093	43984	2106	40459	51915
Input price	11798	2452	6908	19041	11201	3243	6908	19041	12374	1038	10121	15304
No of Obs.	116				57				59			
Lysine price	4159	607	2933	5107	4602	322	3735	5076	3807	547	2933	5107
Input price	277	57	182	521	302	49	247	521	256	56	182	448
No of Obs.	140				62				78			
Carbonblack	800.6	61.9	692.2	939.7	769.2	60.5	692.2	939.7	832.0	45.3	784.4	926.4
Input price	230.9	82.5	105.6	403.8	175.2	60.9	105.6	403.8	292.9	44.0	180.9	363.6
No of Obs.	140				70				70			

Table 2.6. The impact of deregulation in the oil industry

	Dependent variables: product prices						
	Gasoline	Heating oil	Diesel	BC oil	BA oil	Naphtha	Z oil
Constant	2.26**	0.48	-0.66*	-1.31***	-1.28***	0.26**	0.73***
	(0.95)	(0.53)	(0.38)	(0.40)	(0.39)	(0.12)	(0.25)
Dum	1.74	1.54*	2.45***	2.75***	2.59***	-0.13	-0.36
	(2.11)	(0.84)	(0.83)	(0.52)	(0.63)	(0.17)	(0.26)
Input	1.02***	1.99***	2.36***	2.55***	2.90***	0.85***	0.80***
	(0.16)	(0.35)	(0.24)	(0.35)	(0.33)	(0.11)	(0.22)
Dum*Input	-0.10	-0.76*	-1.18***	-1.68***	-1.72***	0.21	0.28
	(0.28)	(0.42)	(0.50)	(0.40)	(0.43)	(0.13)	(0.23)
Adj. R^2	0.9613	0.8992	0.9615	0.9097	0.8764	0.9323	0.9101
No of obs.	140	140	140	140	140	140	140
H_0: $\delta > 0$ (with a 1% critical value being 2.358)							
Test statistics: t	4.63	10.2	11.3	4.4	7.75	1.65	0.06
Test result	$\delta < 0$	$\delta < 0$	$\delta < 0$	$\delta < 0$	$\delta < 0$	$\delta > 0$	$\delta > 0$

* Dum is 1 for the period after deregulation and 0 otherwise.
* The Newey-West procedure is employed, so that the standard errors are autocorrelation and heteroskedasticity robust.

Table 2.7. The impact of deregulation in the oil industry (excluding a recession period)

	Dependent variables: product prices						
	Gasoline	Heating oil	Diesel	BC oil	BA oil	Naphtha	Z oil
Constant	3.06***	1.43***	0.06	-0.50***	-0.43*	0.18	0.61*
	(0.78)	(0.34)	(0.44)	(0.16)	(0.25)	(0.14)	(0.34)
Dum	-4.67**	0.02	0.73***	1.71***	1.09***	-0.29	-0.45
	(2.27)	(0.41)	(0.22)	(0.22)	(0.27)	(0.21)	(0.35)
Input	0.86***	1.34***	1.87***	1.82***	2.14***	0.92***	0.92***
	(0.13)	(0.22)	(0.10)	(0.13)	(0.23)	(0.13)	(0.30)
Dum*Input	0.65**	0.04	-0.49**	-0.86***	-0.68***	0.25	0.27
	(0.26)	(0.23)	(0.11)	(0.15)	(0.24)	(0.16)	(0.31)
Adj. R^2	0.9809	0.9619	0.9891	0.9498	0.9567	0.9446	0.9229
No of obs.	127	127	127	127	127	127	127
H_0: $\delta > 0$ (with a 1% critical value being 2.358)							
Test statistics: t	5.12	10.5	27.6	5.66	11.6	2.16	0.56
Test result	$\delta < 0$	$\delta < 0$	$\delta < 0$	$\delta < 0$	$\delta < 0$	$\delta > 0$	$\delta > 0$

* Dum is 1 for the period after deregulation and 0 otherwise.
* The Newey-West procedure is employed, so that the standard errors are autocorrelation and heteroskedasticity robust.

Table 2.8. The effect of foreign acquisition in the oil industry

	Dependent variables: product prices						
	Gasoline	Heating oil	Diesel	BC oil	BA oil	Naphtha	Z oil
Constant	0.66*** (0.11)	0.54 (1.60)	4.87*** (1.30)	1.03* (0.61)	0.72 (0.99)	0.22* (0.12)	0.42*** (0.14)
Dum1	-0.43** (0.17)	-0.05 (1.47)	-5.54*** (1.55)	-2.34*** (0.58)	-2.00** (0.92)	0.03 (0.18)	0.31 (0.31)
Dum2	-0.56 (0.36)	0.81 (1.59)	-3.83*** (1.37)	0.79 (0.70)	-0.18 (0.97)	-0.84** (0.32)	-0.56*** (0.20)
Input	0.57 (0.12)	1.98** (0.83)	0.08 (0.41)	1.19** (0.59)	1.73* (0.94)	1.02*** (0.09)	1.08*** (0.13)
Dum1*Input	0.44* (0.25)	0.01 (0.74)	2.27*** (0.58)	1.35** (0.53)	1.17 (0.85)	-0.17 (0.16)	-0.27 (0.28)
Dum2*Input	0.67* (0.38)	-0.57 (0.82)	1.23*** (0.42)	-0.50 (0.61)	-0.22 (0.93)	0.39** (0.18)	0.25* (0.14)
Adj. R^2	0.9664	0.9032	0.9697	0.9105	0.8816	0.9410	0.9140
No of obs.	140	140	140	140	140	140	140

* Dum1 is 1 for the period before the deregulation and 0 otherwise.
* Dum2 is 1 for the period after foreign acquisition and 0 otherwise.
* The Newey-West procedure is employed, so that the standard errors are autocorrelation and heteroskedasticity robust.

Table 2.9. The effect of foreign acquisition in the oil industry (excluding a recession period)

	Dependent variables: product prices						
	Gasoline	Heating oil	Diesel	BC oil	BA oil	Naphtha	Z oil
Constant	0.38 (0.44)	1.11*** (0.20)	0.37* (0.21)	1.24*** (0.06)	0.92*** (0.08)	0.06 (0.05)	0.32*** (0.05)
Dum1	-0.07 (0.45)	0.31 (0.40)	-0.30 (0.34)	-1.75*** (0.17)	-1.36*** (0.27)	0.11 (0.15)	0.28 (0.34)
Dum2	-0.29 (0.54)	0.23 (0.60)	0.66 (0.45)	0.58* (0.34)	-0.38 (0.29)	-0.69** (0.31)	-0.46*** (0.17)
Input	0.89* (0.49)	1.56*** (0.09)	1.48*** (0.06)	0.84*** (0.05)	1.24*** (0.06)	1.08*** (0.04)	1.08*** (0.03)
Dum1*Input	-0.03 (0.51)	-0.21 (0.24)	0.38** (0.18)	0.98*** (0.14)	0.90*** (0.24)	-0.16 (0.14)	-0.16 (0.31)
Dum2*Input	0.35 (0.58)	-0.14 (0.18)	-0.15 (0.10)	-0.15 (0.16)	0.26 (0.13)	0.33* (0.16)	0.24*** (0.08)
Adj. R^2	0.9813	0.9615	0.9893	0.9532	0.9564	0.9492	0.9239
No of obs.	127	127	127	127	127	127	127

* Dum1 is 1 for the period before the deregulation and 0 otherwise.
* Dum2 is 1 for the period after foreign acquisition and 0 otherwise.
* The Newey-West procedure is employed, so that the standard errors are autocorrelation and heteroskedasticity robust.

Table 2.10. Pricing behaviour when crude oil prices rise

	Dependent variables: product prices						
	Gasoline	Heating oil	Diesel	BC oil	BA oil	Naphtha	Z oil
Constant	1.64*** (0.44)	1.58*** (0.18)	1.11*** (0.23)	0.04 (0.26)	0.19 (0.28)	0.07 (0.09)	0.54*** (0.09)
Dum	-0.60 (0.37)	-0.30** (0.15)	-0.17 (0.19)	0.19 (0.22)	0.006 (0.23)	-0.16* (0.08)	-0.16* (0.08)
Input	1.18*** (0.04)	1.37*** (0.07)	1.33*** (0.04)	1.57*** (0.13)	1.87*** (0.15)	1.08*** (0.06)	1.01*** (0.05)
Dum*Input	0.04 (0.04)	0.08 (0.05)	0.01 (0.04)	-0.19 (0.12)	-0.09 (0.12)	0.06 (0.06)	0.06 (0.05)
Adj. R^2	0.9594	0.8872	0.9457	0.7923	0.8082	0.9269	0.9102
No of obs.	139	139	139	139	139	139	139

* Dum is 1 when the price of crude oil rises, and 0 otherwise.
* The Newey-West procedure is employed, so that the standard errors are autocorrelation and heteroskedasticity robust.

Table 2.11. Pricing behaviour when crude oil prices rise (excluding a recession period)

	Dependent variables: product prices						
	Gasoline	Heating oil	Diesel	BC oil	BA oil	Naphtha	Z oil
Constant	1.42*** (0.44)	1.44*** (0.12)	0.85*** (0.07)	-0.24* (0.14)	0.19 (0.28)	-0.02 (0.07)	0.50*** (0.10)
Dum	-0.46 (0.36)	-0.20** (0.10)	-0.08 (0.09)	0.36* (0.18)	0.006 (0.23)	-0.10 (0.07)	-0.13 (0.09)
Input	1.20*** (0.05)	1.36*** (0.05)	1.36*** (0.02)	1.67*** (0.08)	1.87*** (0.15)	1.13*** (0.06)	1.02*** (0.06)
Dum*Input	0.03 (0.04)	0.09** (0.04)	-0.0004 (0.02)	-0.25** (0.10)	-0.09 (0.12)	0.04 (0.05)	0.06 (0.05)
Adj. R^2	0.9764	0.9623	0.9871	0.9031	0.8082	0.9438	0.9187
No of obs.	126	126	126	126	126	126	126

* Dum is 1 when the price of crude oil rises, and 0 otherwise.
* The Newey-West procedure is employed, so that the standard errors are autocorrelation and heteroskedasticity robust.

Table 2.12. The effect of foreign acquisition in the paper industry

	Dependent variables: product prices				
	Kraft paper	Sanitary paper	Woody paper	Wood free paper	Art paper
Constant	4.01*** (0.31)	15.67*** (0.9)	4.93*** (0.31)	5.88*** (1.11)	7.42*** (1.06)
Dum	1.61*** (0.42)	2.70** (1.26)	2.57*** (0.45)	7.06*** (1.33)	5.72*** (1.24)
Input	0.29*** (0.06)	0.59*** (0.13)	0.24*** (0.06)	0.72*** (0.16)	0.65*** (0.16)
Dum*Input	-0.22*** (0.08)	-0.39** (0.17)	-0.27*** (0.08)	-0.71*** (0.19)	-0.63*** (0.19)
Adj. R^2	0.5557	0.3090	0.7740	0.7500	0.6722
No of obs.	140	140	140	140	140
H_0: $\delta > 0$, i.e.,	H_0: $\varphi < 1.13$	H_0: $\varphi < 1.07$	H_0: $\varphi < 0.83$	H_0: $\varphi < 0.83$	H_0: $\varphi < 0.83$
Test statistics: t	-21.0	-9.24	-5.72	-0.84	-1.27
Test result	$\delta > 0$	$\delta > 0$	$\delta > 0$	$\delta > 0$	$\delta > 0$

* The first three columns examine the effect of foreign acquisition, while the last two columns are given to compare the results with papers which have no foreign acquisition. Dum is 1 for the period after foreign acquisition and 0 otherwise.
* The Newey-West procedure is employed, so that the standard errors are autocorrelation and heteroskedasticity robust.

Table 2.13. The effect of foreign acquisition in the paper industry (excluding a recession period)

	Dependent variables: product prices				
	Kraft paper	Sanitary paper	Woody paper	Wood free paper	Art paper
Constant	3.88***	1.53***	4.78***	5.83***	7.38***
	(0.14)	(0.05)	(0.28)	(1.11)	(1.06)
Dum	1.36***	0.29***	2.73***	7.17***	5.74***
	(0.24)	(0.09)	(0.39)	(1.32)	(1.25)
Input price	0.33***	0.66***	0.25***	0.69***	0.60***
	(0.03)	(0.09)	(0.05)	(0.15)	(0.15)
Dum*Input price	-0.18***	-0.44***	-0.28***	-0.70***	-0.58***
	(0.04)	(0.15)	(0.07)	(0.19)	(0.19)
Adj. R^2	0.5957	0.3447	0.8759	0.8056	0.7778
No of obs.	127	127	127	127	127
H_0: $\delta > 0$, i.e.,	H_0: $\varphi < 1.13$	H_0: $\varphi < 1.07$	H_0: $\varphi < 0.83$	H_0: $\varphi < 0.83$	H_0: $\varphi < 0.83$
Test statistics: t	-27	-7.16	-4.95	-0.35	-0.87
Test result	$\delta > 0$	$\delta > 0$	$\delta > 0$	$\delta > 0$	$\delta > 0$

* The first three columns examine the effect of foreign acquisition, while the last two columns are given to compare the results with papers which have no foreign acquisition. Dum is 1 for the period after foreign acquisition and 0 otherwise.
* The Newey-West procedure is employed, so that the standard errors are autocorrelation and heteroskedasticity robust.

Table 2.14. The effect of foreign acquisition in other industries

	Dependent variables: product prices				
	Whiskey		Lysine	Carbon black	
	1st acquisition	2nd acquisition		Whole sample	Foreign acquisition
Constant	3.52*** (0.24)	3.29*** (0.28)	5.88*** (0.24)	7.26*** (0.19)	7.26*** (0.19)
Dum	0.20 (0.70)	1.55*** (0.36)	-3.34*** (0.49)	0.34*** (0.08)	0.68 (0.50)
Input	0.69*** (0.23)	1.08*** (0.27)	-4.24*** (0.63)		0.29 (0.19)
Dum*Input	-0.03 (0.60)	-1.45*** (0.34)	9.29*** (1.87)		-0.17 (0.23)
Adj. R^2	0.2674	0.3706	0.5913	0.2733	0.2852
No of obs.	116	116	140	140	140
H_0: $\delta > 0$, i.e.,	H_0: $\varphi < 0.70$		H_0: $\varphi < 1.428$	H_0: $\varphi < 2.0$	
Test statistics: t	0.61		1.15	-18	
Test result	$\delta > 0$		$\delta > 0$	$\delta > 0$	

* Dum is 1 for the period after foreign acquisition and 0 otherwise.
* The Newey-West procedure is employed, so that the standard errors are autocorrelation and heteroskedasticity robust.

Table 2.15. The effect of foreign acquisition in other industries (excluding a recession period)

	Dependent variables: product prices				
	Whiskey		Lysine	Carbon black	
	1st acquisition	2nd acquisition		Whole sample	Foreign acquisition
Constant	4.43*** (0.24)	2.79*** (0.56)	6.36*** (0.66)	7.26*** (0.19)	9.11*** (0.21)
Dum	0.42 (0.54)	2.05*** (0.60)	-3.49*** (0.08)	0.34*** (0.08)	-1.43*** (0.45)
Input	-0.34 (0.22)	1.59** (0.63)	-5.90*** (2.22)		-1.08*** (0.12)
Dum*Input	0.06 (0.45)	-1.96*** (0.65)	9.21*** (3.24)		1.29*** (0.18)
Adj. R^2	0.2616	0.2967	0.6701	0.2733	0.6327
No of obs.	103	103	127	127	127
H_0: $\delta > 0$, i.e.,	H_0: $\varphi < 0.70$		H_0: $\varphi < 1.428$	H_0: $\varphi < 2.0$	
Test statistics: t	-0.18		3.60	-18	
Test result	$\delta > 0$		$\delta < 0$	$\delta > 0$	

* Dum is 1 for the period after foreign acquisition and 0 otherwise.
* The Newey-West procedure is employed, so that the standard errors are autocorrelation and heteroskedasticity robust.

Table 2.16. The prediction on the effects of the deregulation in the LPG industry

	Dependent variables: product prices					
	Butane			Propane		
	Deregulation (short sample)	Deregulation (whole sample)	FTC's decision	Deregulation (short sample)	Deregulation (whole sample)	FTC's decision
Constant	2.21*** (0.49)	2.21*** (0.49)	1.53*** (0.39)	2.12*** (0.54)	2.12*** (0.54)	1.50*** (0.52)
Dum	2.74*** (0.78)	1.18 (0.75)	6.72*** (1.69)	0.23 (0.63)	0.63 (1.20)	1.58 (0.98)
Input	1.28*** (0.17)	1.28*** (0.17)	1.57*** (0.08)	1.59*** (0.20)	1.59*** (0.20)	1.88*** (0.17)
Dum*input	-0.30 (0.21)	0.02 (0.20)	-0.93*** (0.24)	0.30 (0.21)	0.05 (0.33)	-0.39 (0.27)
Adj. R^2	0.7460	0.8988	0.8926	0.7029	0.7340	0.7145
No of obs.	114	140	140	114	140	140

* Dum is 1 for the period after the deregulation and 0 otherwise in the first and second column for each product, while Dum is 1 for the period after FTC's decision and 0 otherwise in the third column.

* The hypothesis that Ho: $\delta > 0$ is rejected at a 1 % level for both cases. In other words, the results suggest a constant elasticity demand function for both products.

Table 2.17. The prediction on the effects of the deregulation in the LPG industry (excluding a recession period)

	Dependent variables: product prices					
	Butane			Propane		
	Deregulation (short sample)	Deregulation (whole sample)	FTC's decision	Deregulation (short sample)	Deregulation (whole sample)	FTC's decision
Constant	1.77*** (0.47)	1.77*** (0.47)	1.00*** (0.24)	1.81*** (0.50)	1.81*** (0.50)	1.00*** (0.38)
Dum	3.18*** (0.75)	1.61*** (0.74)	7.25*** (1.66)	0.54 (0.59)	0.94 (1.15)	2.08** (0.92)
Input	1.33*** (0.21)	1.33*** (0.21)	1.67*** (0.07)	1.58*** (0.23)	1.58*** (0.23)	1.98*** (0.16)
Dum*input	-0.35 (0.24)	-0.02 (0.23)	-1.03*** (0.24)	0.30 (0.24)	0.06 (0.34)	-0.48* (0.27)
Adj. R^2	0.8836	0.9538	0.9460	0.8566	0.8648	0.8255
No of obs.	101	127	127	101	127	127

* Dum is 1 for the period after the deregulation and 0 otherwise in the first and second column for each product, while Dum is 1 for the period after FTC's decision and 0 otherwise in the third column.

* The hypothesis that Ho: $\delta > 0$ is rejected at a 1 % level for both cases. In other words, the results suggest a constant elasticity demand function for both products.

Chapter 3

Foreign Firms and Price Competition in the Korean Grocery Superstore Industry

3.1 Introduction

Concerning the competitive consequences of foreign firms, the entry mode of FDI firms can affect their competitive impact. While greenfield FDI at least initially reduces market concentration, the acquisition of existing firms leaves the concentration unchanged. Furthermore, greenfield FDI firms as new establishments unfamiliar with local ways may act as a more disturbing competitive force than M&A FDI firms or local counterparts. Consequently, green-field FDI firms can be expected to produce more competitive outcomes. Recognizing the possible heterogeneity arising from different entry modes, the previous studies also attempted to control for this in their estimations, although not sufficiently. In explaining variations in industry margins, Co (2001) constructs two models which use either M&A FDI or greenfield FDI occurrences as a control variable, while Chung (2001) creates an industry average entry mode as an independent variable. In contrast, this study examines the competitive effect of each entry mode separately. In the preceding chapter, I studied the competitive consequences of foreign acquisition,

finding that foreign acquisition has no significant effect on pricing behaviour. This chapter explores the competitive effect of greenfield FDI firms by looking into pricing behaviour where only greenfield FDI took place.

The grocery superstore industry in Korea provides an ideal opportunity to explore the effect of green-field FDI. First, the rapid expansion of the superstore sector along with a considerable degree of foreign entry produces significant variations in foreign presence over time even within a short spell of time. Since 1996, when the prohibition of foreign entry into the superstore sector was lifted, several global retail giants have entered, to quickly build up their chain networks. Secondly, by the nature of the retail industry, there exist local markets in the superstore industry, which allows us to observe cross-sectional variations in foreign firms' presence. For the estimation, this chapter looks into the grocery superstore sector in Seoul from Jan. 2001 to Dec. 2003, for which we can obtain store-level prices data.

The main questions of this chapter are how different foreign firms are in pricing behaviour and how local and foreign firms react to each other. That is, the focus lies on the existence of difference or rivalry between local and foreign firms concerning price behaviour. If foreign firms affect pricing behaviour in the industry, there could be several possible manners in which this could happen. First, foreign firms could be more competitive in pricing policies than their domestic counterparts, as the traditional argument expects. As newcomers, they might not settle into the existing pattern of gentlemanly competition, so that they could stir up the collusive stability among local firms. Or they might be eager to build up their market share in a new market. Secondly, in response to foreign firms' competitive pricing, domestic

firms may adopt more competitive pricing policies where foreign competitors have a presence. Given that most foreign firms are global giants which are thought to have competitive advantages over them, domestic firms might fear foreign competitors more than domestic ones. So even if foreign firms do not initiate competitive pricing policies, domestic firms might adopt more competitive pricing policies where foreign firms have a presence. Obviously, due to the strategic interdependence between competitors in oligopolies, a price-cut by any firm may provoke reactions from other competitors, leading to a situation where all the firms charge more competitive prices. To check this possibility, I set up an additional hypothesis that the competitive level in markets with foreign firms is higher than without foreign firms.[1]

For the estimation, I construct a reduced form of pricing equation based on a simple logit demand model. The logit demand follows Berry's (1994) formulation, which allows for estimation without micro-level data, unlike the traditional discrete choice model influenced by Mcfadden (1981). For the specification of the supply side, I do not impose any specific assumptions on market equilibrium, unlike many other studies. Instead, I attempt to measure the level of competitive intensity relative to Bertrand competition, following Kadiyali et. al. (2001) and Sudhir et. al. (2001). Their methodology is a conduct parameter approach in the context of the

[1] Foreign entry through green-field investment populates industries to make markets less concentrated, which may, in turn, increase price competition. The ideal estimation would be to separate the competitive effect of addition of capacity from the competitive effect arising from the more competitive behaviour foreign firms might bring in. In this study, I focus on the above three processes, since I could not differentiate this effect from the others. Another justification for this is that there is no difference in this effect between domestic and foreign entry.

differentiated products industry, which allows us to measure the level of competitiveness by referring to a specific coefficient.

Although the introduction of the simple logit demand leaves an analytical form of pricing equation, the logit model entails the well-known Independence from Irrelevant Alternatives (IIA) property, which is equivalent to imposing a proportional substitution pattern across alternatives. The IIA property predicts that when a new entrant enters a market or a player lowers its prices, every player loses its market share proportionally. This implies that, in absolute terms, players with a larger market share lose more compared to other players with less market share. Although it is unrealistic in many settings, the IIA property is likely to reflect the economic reality in the superstore industry in Korea, where superstores are expanding at the expense of other formats of grocery stores, such as small grocery stores, which currently have a larger market share. And the existence of local markets alleviates the problem of unreasonable substitution patterns. By identifying local markets, we restrict substitution to taking place among superstores located nearby. Accounting for the fact that travel distance to a superstore is the most important factor in consumers' choosing superstores to shop at, this restriction seems quite reasonable.

Another issue arises from data availability. Direct sales data or store traffic data are not available. Instead, I construct market shares based on the parking space of superstores, which is found to be highly correlated with sales in the superstores. Although parking space is time invariant, the constructed market shares vary over time due to new entrants and exits. When new entry or exit takes place, I calculate market shares using the IIA property of the logit model. The nature of constructed

market shares has important implications for the estimation frameworks. The constructed market share does not vary unless new entry or exit happens, which means that the market share is determined out of the system. Therefore, similar to price-concentration studies, this study infers the pricing behaviour from the reactions of firms to varying market structure.

The estimation strategy is similar to Parker and Roller (1997) and Sudhir et al. (2001). First I divide the sample into two groups of superstores and then estimate the level of competitiveness to make a comparison between these groups. To test the first hypothesis, that foreign stores are more aggressive in their pricing policies, I form two groups of superstores, such as foreign chains and domestic chains. Using a standard dummy variable technique, I then check whether there is a significant difference in the conduct parameter between the two groups. To examine the second hypothesis, I form a sub-sample using only observations of domestic superstores and then divide this sample into two groups, where one is a group of domestic superstores facing foreign competitors and the other is not. The similar dummy variable technique explained above is adopted to compare the conduct parameters for these two groups. A significant difference in the conduct parameter between these two groups suggests that domestic firms react more sensitively to the presence of foreign competitors. The same technique applies to the test of the third hypothesis. The only difference is to group by markets with foreign stores and those without. In addition, there is a possibility that factors other than the distinction between local and foreign firms play an important role in price competition. To check this, I estimate

another hypothesis that there is a significant difference in the pricing policy between leading and small chains.

Unlike the previous studies, the results do not support the popular notion that foreign firms increase price competition. I find that the level of competitiveness between domestic and foreign stores is not significantly different, rejecting the first hypothesis. Regarding the second hypothesis, it does not seem that domestic stores adopt a more competitive pricing policy where they face foreign competitors. And there is no indication that markets with foreign stores are more competitive than those with only domestic stores. In short, foreign firms do not have a significant effect on price competition. In addition, I find that leading chains charge more competitive prices than small chains. Considering that the leading chains are a group of foreign and domestic retail giants, this finding also supports the main result that foreign firms have no significant effect on price competition.

More experiments reveal the pattern that superstore chains set competitive prices for high-selling items, while less competitive prices for other items. Especially, this practice is apparent in leading chains' pricing. And competitive intensity appears to increase as non-food product lines expand. Holton's (1957) analysis provides a likely explanation. Superstores expand their product lines to non-food items with better margins in response to narrowing margins on high-selling items (or traffic builders). The expansion of new items, in turn, allows superstores to adopt a more aggressive pricing policy on traffic builders, since they can compensate for small margins on traffic builders with large margins on new items.

The structure of the chapter is as follows. Section 2 gives a brief review of previous studies. Section 3 provides background information about the Korean grocery superstore industry. In Section 4, I construct the theoretical and empirical model, with some discussion of its properties. Section 5 discusses the market definition and data. Section 6 presents the results of the estimation, and Section 7 concludes.

3.2. Review of previous studies

As outlined in the previous chapter, a small number of studies, such as Caves (1974), Co (2001) and Chung (2001), have examined the margin effects of FDI firms. However, this approach is subject to several criticisms. The price–market structure approach may be an alternative paradigm to examine the effect of foreign firms on price competition. This approach, based on a cross section of similar local markets, examines the relationship between prices and concentration to see how concentration affects prices. Finding a positive relationship between price and concentration is interpreted as suggesting that higher concentration causes higher prices and higher price-cost margins.

There are several studies which employ the price-market structure paradigm in the retail industry. Lamm (1981), Cotteril (1986), and FTC vs Staples case (1997),[2] among many, fall within this type of study. They all find that market concentration has a positive effect on prices after controlling demand and cost side

[2] See Baker (1999) and Dalkir and Frederick (1999).

factors, concluding that higher concentration leads to market power. Obviously, this approach has at least two advantages over the structure-performance paradigm. First, by using prices as a dependent variable, it can avoid measurement errors relating to the construction of profits (Marvel, 1978). Second, this approach typically looks at a cross-section of very closely related markets so that it can alleviate the problem of the inter-industry analysis stated above (Anderson, 1990).

These studies, however, share common problems with the structure and performance studies. Although concentration is usually taken as exogenous in the price-market structure studies, concentration can be endogenous through the feedback from performance to structure, as Evans et al. (1993) argued. As Anderson (1990) pointed out, both paradigms lack a robust theoretical foundation derived from a model of firms' optimising behaviour. This problem causes a failure in providing clear guidance for specifications and inferences: those variables which should be included are not made clear, only depending on an ad-hoc specification. More importantly, Bresnahan (1989) raised a pertinent argument, that a positive relationship between prices and concentration may not ensure the interpretation that higher concentration causes higher price-cost margins by changing conduct. Let us examine an example he presents. If the most cost-efficient firm in less concentrated markets, which plays an important role in setting market prices, is more efficient than the equivalent one in concentrated markets, then higher concentration may coincide with higher prices. This statistical relationship, however, does not necessarily imply more cooperative market behaviour in the concentrated markets. Otherwise, it could

be the result of lower costs in the less concentrated markets. Price-market structure studies have provided no satisfactory answer to this problem.

A growing number of studies examine the nature of competition in differentiated product industries, employing a structural model where the demand system is combined with a pricing equation. For the specification of the demand system with differentiated products, many researchers rely on the discrete choice model, which has an advantage over the traditional supply and demand analysis that the parameters to be estimated are parsimonious. In particular, the methodology proposed by Berry (1994) and Berry et al. (1995) is very popular, since the method allows researchers to analyse the demand system when only aggregate data are available. While many studies, including Berry et al. (1995), focus on estimating unbiased demand and cost parameters under imperfect competition, assuming Bertrand competition, several papers show an interest in measuring market power in differentiated product industries. Loosely speaking, there are two types of approaches in identifying market power: the menu approach, and the conduct parameter approach. The logic of the menu approach is as follows (see Kadiyali et al. 2001): first construct several econometric estimation models under different equilibrium assumptions, secondly estimate each of these models separately, and lastly choose one equilibrium that fits the data best, using goodness of fit tests. On the other hand, the conduct parameter approach attempts to identify different types of equilibrium through one parameter which measures market power (see Kadiyali et al. 2001).

Taking the first approach, Nevo (2001) estimates market power in the ready-to-eat cereal industry, comparing price-cost margins from different models of equilibrium with a crude measure of actual price-cost margin. Sudhir et al. (2001) and Sudhir (2001) take the latter, introducing the method of measuring competitive interactions relative to Bertrand competition. While Sudhir estimates time-invariant conduct parameters in each of several segments of the auto market, Sudhir et. al. focus on examining how demand and cost factors affect the level of market competitiveness, allowing market conduct to vary over time. On the other hand, it is very often the case that researchers face a situation where key variables are not available, such as market shares or prices. Thomadsen (2001) and Smith (2004) provide ways to estimate the discrete choice demand and supply without either market shares or prices data respectively. Thomadson specifies the demand system as a function of travel distances to fast food restaurants and prices, from which he constructs market shares using the famous logit formula. Then he employs the constructed market shares in the estimation in place of actual market shares. Smith does not obtain prices data for his sample supermarkets. Instead, he introduces chain dummy variables to capture variations in prices across supermarkets, taking advantage of the fact that supermarket operators set prices uniformly within a region.

3.3 The Korean grocery superstore industry

In this study, a grocery superstore is defined as a retail store with more than 3,000 square meters of floor space, selling groceries such as food, alcoholic and non-

alcoholic drinks, cleaning products, toiletries, household goods, etc.[3] Loosely speaking, there are five types of retail stores where consumers can purchase groceries: a convenience store, a small grocery store, a conventional market, a department store and a superstore.[4] Among them, a superstore is a very distinctive format of grocery store in the sense that it provides consumers with one-stop grocery shopping to meet their weekly grocery needs. On average, a small grocery store and a convenience store are 600 square meters and 100 square meters in size respectively, while a superstore exceeds 13,000 square meters with over 30,000 items stocked (Korean Chamber of Commerce and Industry, 2002 and 2003). A department store focuses its business on clothing and footwear, earning only 14 per cent of its sales from food, while a superstore is a fully-lined-up grocery store, with grocery sales accounting for 70 per cent of its total sales (Korea National Statistical Office, 2003). Although conventional markets still play an important role in fresh food shopping, they cannot offer such a wide range of groceries and shopping quality as a superstore provides.

The superstore was introduced by Emart for the first time in 1993. Since then, the superstore industry has been expanding very rapidly in terms of the number of outlets and turnover. As presented in Table 3.1, the number of superstores soared from 1 in 1993 to 222 in 2002. The total sales increased from 0.6 trillion Korean won

[3] Although a grocery superstore is generally called a discount store in Korea, it is not like the discount store in the UK providing a limited range of goods at low prices, but rather equivalent to a supermarket in UK. Sometimes it is also called a supercenter. Here, I use the term superstore, rather than supermarket, to avoid confusion with a small grocery store, which is generally called a supermarket in Korea.

[4] A conventional market is a shopping area where a number of small retail or wholesale stores cluster with a lot of stalls. Typically many grocery stores in a conventional market focused on selling fresh food.

in 1995 to 17 trillion Won in 2002. Until recently, the pace of expansion has hardly seemed to slow down. Over the recent three years of 2000 to 2002, superstore chains doubled their number of outlets, with the turnover increasing at an annual rate of over 20%. Unsurprisingly, the rapid expansion of the superstore sector has coincided with the decline of other grocery formats, particularly small grocery stores and conventional markets. According to a survey carried out by the Korea Chamber of Commerce and Industry in 2002, small grocery stores and conventional markets suffered a 26 per cent drop in their sales when a new superstore opened nearby.

This rapid development inevitably involves changes in market structure both on a national level and on a local level, providing a unique situation where we observe significant variations in market structure within a short spell of time as well as across areas. In particular, as the present top five chains started to aggressively expand their networks in 1996, they have emerged as market leaders quickly, with the market structure deteriorating. The current top five chains are Emart, Lottemart, Tesco, Carrefour and Walmart, where the first two are domestic and the last three foreign. Table 3.1 shows the trend of the number of their outlets and sales. Note that, except Emart, the other operators entered the industry relatively recently. Even Emart was not a leading operator up to 1996. The top five operators together accounted for more than 60 per cent of outlets in 2002. And their market share increased from 45% in 1999 to about 80 % in 2002, indicating a very concentrated market. In particular, Emart, the market leader, occupies more than 30 % of the market, selling slightly less than the sum of the next three leading chains' sales. In short, the superstore industry is characterized as a typical oligopoly industry.

[Insert Table 3.1 here]

Another interesting characteristic of the industry is that there is a sharp contrast in the role of foreign chains between the periods before and after 1996. This arises from the fact that government policy over foreign entry dramatically changed from total prohibition to full concession of free entry in 1996.[5] Since Carrefour opened the first foreign store in 1996, several global retail giants, such as Tesco (1997), Walmart (1998) and Costco Wholesale (1998), have entered the superstore industry. Although Walmart and Costco Wholesale entered the market through M&A, most of their expansion has been made through green-field investment. As for 2002, they together accounted for one third of the market, while Tesco, Carrefour and Walmart took the positions of the second, fourth and fifth leading chain respectively. Over the growing presence of the foreign chains, there has been a widespread fear that the global retail giants will out-compete domestic chains and dominate the market due to their managerial superiority along with global sourcing power.

An interesting pattern of foreign entry is that such firms appear to have a strong presence in several metropolitan areas, such as Seoul, while they have few outlets in the provinces. In this regard, Seoul is a good area in which to examine the impact of foreign entry, along with the fact that Seoul consists of a number of local markets. As Table 3.2 shows, the number of superstores in Seoul has risen sharply

[5] Until 1996, foreign firms were allowed to open only less than 20 stores with floor space of less than 3,000 square meters, which had the effect of virtually prohibiting foreign firms from entering the superstore industry.

since 1998, tripling from 14 in 1998 to 45 in 2003. As for 2003, although superstores in Seoul took one sixth of the total outlet number, they accounted for about one fourth of the total superstore sales (Korea National Statistical Office, 2004). Out of 18 new outlets opened from 2001 to 2003, 16 outlets were opened by the big four operators, which made them dominant players in Seoul. All of the foreign chains have their presence in Seoul. As for 2003, there were 14 foreign outlets in Seoul, taking about one third of the total number. Carrefour is a dominant chain (7 outlets) among foreign ones, followed by Tesco (3 outlets), Costco Wholesale (3 outlets) and Walmart (1 outlet).

[Insert Table 3.2 here]

Table 3.3 presents various statistics relating to superstores. The first row represents the gross margin. The upward trend of the gross margin may reflect the increasing bargaining power of superstores due to their expansion. The operating profit fell sharply in 2002. The average size of superstores exceeds 13,000 square meters, slightly less than that of department stores but a great deal larger than other grocery stores. The number of items stocked in superstores is in a constantly upward trend.

[Insert Table 3.3 here]

3.4 The model

To measure the level of market competitiveness, I construct a reduced form of pricing equation based on a simple logit demand. The logit demand follows Berry's (1994) formulation, where an unobserved product characteristic enters the mean utility, serving as an error term in the demand regression equation. Unlike the traditional discrete choice model influenced by Mcfadden (1981), Berry's methodology allows for the estimation using only macro data, such as brand (or firm)-level data. For the specification of the supply side, I do not impose any specific assumption on market equilibrium. Instead, following Kadiyali et al. (2001) and Sudhir et al. (2001), I attempt to measure the level of competition intensity relative to Bertrand competition.

3.4.1 The theoretical model

Suppose that we observe r = 1, …… , R markets, each with j= 1, …., J_r superstores. Each superstore is assumed to be a differentiated product for one-stop grocery shopping. From the perspective of consumers doing grocery shopping, a superstore can be viewed as a product possessing a bundle of distinctive characteristics, as Smith (2004) and the UK Competition Commission (2000) assume. The model allows consumers to purchase their groceries from other formats of grocery stores, in other words, the existence of the outside good j=0. In addition, we

can introduce another dimension of time, which defines a market as a combination of market and time, expanding the number of markets observed. Yet, here, for notation convenience, I do not consider the time dimension.

3.4.1.1 The demand side

Suppose there are, in each market, i = 1, …., I_r consumers, each of whom chooses a store from a choice set with J + 1 alternatives (j= 0, 1, 2,…., J_r) and undertakes to buy a basket of weekly grocery shopping in a shopping period.[6] Consumers choose the alternative from which they can derive the highest utility. If the utility of superstores is less than that of the outside good, then consumers choose the outside good. The indirect utility of consumer i from choosing superstore j in market r is assumed to be a function of observed and unobserved superstore characteristics, price, consumer characteristics and unknown parameters. For a linear specification, the utility is given by

$$(3.1)\quad u_{ijr} = x_{jr}\beta - \alpha\, p_{jr} + \xi_{jr} + \varepsilon_{ijr} \qquad i = 1, \ldots\ldots, I, \quad j = 1, \ldots . Jr, \quad r = 1, \ldots\ldots, R$$

where x_{jr} is a k-dimensional vector of observed superstore characteristics, β is a k-dimensional vector of taste parameters which are assumed to be invariant across

[6]. Doubt could be raised about this assumption which is typical in the discrete choice model. In many cases, such as the purchase of a car or cereal, this might not hold true. People could buy more than one box of cereal or possess more than one car. Similar arguments can be applied to the grocery shopping in the superstore sector. The size and items of a basket vary across households since they are different in their size or income level. However, it is not so restrictive to assume that each person consumes a similar amount of groceries in a shopping period. Even if this assumption is not acceptable, I could say that this model is viewed as an approximation, as Nevo (2001) argues.

consumers, p_{jr} is the price of superstore j in market r, α is the price response parameter to represent the level of dis-utility of the price consumers pay, ξ is the unobserved superstore characteristic, and ε is a random utility with a zero mean and unit variance, representing idiosyncratic consumers' preferences for superstores.

The mean utility plays an important role in the estimation procedure proposed by Berry (1994). Taking expectations on both sides of (3.1), the mean utility, denoted by δ_{jr}, of superstore j in market r is given as

(3.2) $\delta_{jr} \equiv x_{jr}\beta - ap_{jr} + \xi_{jr}$

The existence of the outside good requires the specification of the utility from choosing not to purchase from superstores. In this context, the outside good can be viewed as shopping from other formats of stores, such as small grocery stores. Without the outside good, the homogenous increase in prices of all superstores does not lead to the decrease of quantities sold in the superstore sector. The utility of the outside good is given by

(3.3) $u_{i0r} = \varepsilon_{i0r}$

It should be noted that the price and characteristics of the outside good are set to be zero, that is, $p_{0r} = 0$, $\xi_{0r} = 0$, and $x_{0r} = 0$. This is equivalent to normalizing the utility relative to the outside good, the mean utility of which is normalised to zero. In the consumer choice, the absolute level of utility does not matter, but the difference in utility matters.[7] So it does not alter consumers' choices to normalize the level of

[7] As said earlier, a consumer chooses the alternative from which he derives the highest utility. That is, the choice rule is that $u_j - u_k > 0, \forall j \neq k$, which depends on the relative difference in utility, not on the absolute level.

utility relative to one of the alternatives, as long as the relative differences in utility are maintained. And it is a common practice to measure utility relative to the outside good and to normalize that of the outside good to zero.[8]

Now suppose that the random variable in (3.1) follows the distribution of i.i.d. Type I extreme value across products and consumers. Then, the well-known logit formula gives the market share of superstore j in market r as follows:

$$(3.4)\ s_{jr} = \frac{\exp(\delta_{jr})}{\sum_{k=0}^{J} \exp(\delta_{kr})}$$

With the mean utility of the outside good normalised to zero, the difference between logs of the market shares of product j and the outside good gives

$$(3.5)\ \ln(s_{jr}) - \ln(s_{0r}) = \delta_{jr} \equiv x_{jr}\beta - \alpha p_{jr} + \xi_{jr}$$

where s_{jr} and s_{0r} are observed market shares. Now we can treat (3.5) as an estimation equation. The mean utility can be easily calculated from the observed market shares. The unobserved product characteristic can be viewed as an error term. It should be noted that the price is endogenous in (3.5), in that the price is affected by the error term. Therefore, the instrumental variable regression is needed to obtain a consistent estimator for the coefficients of interest. Note that equation (3.5) requires only store level data, which implies that we can estimate the demand parameters without micro level data.

3.4.1.2 The supply side

[8] It is obviously an option to normalize to some value other than zero. However, there is no point in doing this, since normalizing to zero is easier with the same effect. (Train, 2003)

While many studies simply assume Bertrand competition, I allow the conduct parameter as a free parameter measured relative to the Bertrand competition, following Kadiyali et al. (2001), and Sudhir et al. (2001). Prices are assumed to be a strategic variable since, where products are viewed as differentiated ones, price competition is a more appealing assumption than quantity competition (Kadiyali et al., 2001). Each superstore is assumed to maximize their profits. The profit function of superstore j in market r is given by

$$(3.6)\quad \begin{aligned} \prod_{jr} &= (p_{jr} - mc_{jr})Q_{jr} - C_{jr}^{f} \\ &= (p_{jr} - mc_{jr})M_r s_{jr} - C_{jr}^{f} \end{aligned}$$

where s_j is the market share of superstore j, mc_{jr} is the marginal cost of superstore j, M_r is the size of market r, and C^f is the fixed cost.

Suppose that superstores compete with each other under the Bertrand competition. Then the first order condition is given by

$$(3.7)\quad p_{jr} = mc_{jr} - \frac{1}{(\partial s_{jr} / \partial p_{jr})} * s_{jr}$$

Under the assumption of the logit model set out above, the term, $(\partial s_{jr}/\partial p_{jr})$, in (3.7) is given as

$$(3.8)\quad \frac{\partial s_{jr}}{\partial p_{jr}} = \frac{\partial s_{jr}}{\partial \delta_{jr}} \frac{\partial \delta_{jr}}{\partial p_{jr}} = -\alpha \frac{1}{s_{jr}(1 - s_{jr})}$$

where α is the price response parameter in the demand system.

Substituting (3.8) into (3.7), the first order condition reduces to

$$(3.9)\quad p_{jr} = mc_{jr} + \frac{1}{\alpha(1 - s_{jr})}$$

Note that the second term on the right hand side is the Bertrand margin. If superstores set prices more cooperatively (or competitively), the margin will be larger (or smaller) than this. By introducing a multiplier Φ on the Bertrand margin, therefore, we could measure how large the margin is relative to the Bertrand competition: in other words, how competitive a market is.

With the introduction of a multiplier on the Bertrand margin, the pricing equation is given as

$$(3.10)\quad p_{jr} = mc_{jr} + \frac{\Phi}{\alpha(1-s_j)}$$

The interpretation of Φ is as follows: Φ =1 is indicative of the Bertrand competition. If we benchmark the level of competition against the Bertrand one, $0 < \Phi < 1$ is more competitive and $1 < \Phi$ is more co-operative. Note that there is no upper bound unlike in the case of homogeneous products.[9] However, there can exist a lower bound. When Φ = 0, price-cost margins become zero, which means perfect competition. This lower bound provides an interesting implication in interpreting an estimate of the parameter Φ. When we have an insignificant estimate of Φ, it should not be viewed as a mis-specification of the model, but as an indication of perfect competition.

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[9] In the case of homogenous products, the pricing equation with a conduct parameter is given by

$$P = mc_i - qi\frac{\partial P}{\partial Q}(1+\theta)$$

where θ indicates a conduct parameter. θ being minus one means perfect competition, θ equal to zero is indicative of Cournot competition, and θ equal to (n-1) is perfect collusion. Hence the conduct parameter in the case of homogenous products has a lower and upper bound. (See Bresnahan, 1989)

3.4.2 The empirical model

The joint estimation of the pricing equation and demand equation produces estimates of the conduct parameter as well as the demand and cost parameters. However, due to the nature of the predetermined market shares data, explained later, this study mainly estimates a reduced form pricing equation. To estimate the pricing equation, we need to specify the marginal cost function. Assuming a constant marginal cost, I specify the marginal cost as a function of several observed and unobserved factors:

$$(3.11)\quad mc_{jrt} = \gamma_{jr} + \beta_1 wholesale_{jrt} + time'\beta_2 + \beta_3 chainsize_{jrt} + \upsilon_{jrt}$$

where wholesale is prices paid by superstores to buy products from manufacturers. Time stands for a vector of two time dummy variables, chainsize represents the size of a chain, γ is a vector of store specific dummies and υ is an error term.

The inclusion of wholesale and two time dummies reflects the cost structure in the superstore industry, which consists of three major factors: wholesale prices, and wage and distribution costs. Obviously, wholesale prices are a huge factor in the marginal cost in the retail industry in general. According to the UK Competition Commission (2000), the cost of buying goods covers more than 70 percent of the total revenue in superstores. The coefficient β_1 is expected to have a positive sign.[10] And the labour and distribution cost are the next most important cost factors. I could

[10] It may be argued that wholesale prices might be endogenous. In the model, the observation unit is not a chain but a store. And sales in a superstore are marginal compared to the total sales of superstores or all grocery stores. Note that a store is just one out of more than 200 stores. Although a large chain obviously has bargaining power against manufacturers, a single store is less likely to affect wholesale prices.

not obtain wage rate and distribution cost data by stores on a monthly basis. Since wage contracts are settled once a year and the distribution cost hardly varies on a monthly basis, however, it is not unreasonable to assume that these cost factors do not vary very much over a year. Since the sample period covers three years 2001 to 2003, two time dummies are introduced. Time 1 is assigned 1 for 2002 and 0 otherwise, and Time 2 is assigned 1 for 2003 and 0 otherwise. It should be noted that the time dummies capture all the cost factors as well as margin factors which vary over time, which could have a negative or positive effect on prices. So, the sign of the parameter β_2 is ambiguous. Chainsize serves as a proxy for chain level economies of scale, measured by the number of stores within a chain. The rapid expansion of chain networks may allow large chains to enjoy chain-level economies of scale through bargaining power. The coefficient β_3 is expected to have a negative sign when chain level economies of scale exist. The store-specific dummy variables are introduced to control for unobserved store-specific cost factors. Store-level economies of scale, if any, could be captured by these store-specific dummies.

With the addition of the marginal cost function, the pricing equation is completed as

$$(3.12)\ p_{jrt} = \gamma_{jr} + \beta_1 wholesale_{jrt} + time'\beta_2 + \beta_3 chainsize_{jrt} + \Phi \frac{1}{a}\frac{1}{(1-s_{jrt})} + \upsilon_{jrt}$$

where Φ is the conduct parameter of interest. Note that the conduct parameter in the equation above measures the overall level of market competitiveness. With the estimation of the reduced form pricing equation, we could not separate the market conduct Φ from the price response parameter α. However, given the assumption that

the price response parameter is constant across markets and over time, the introduction of a dummy variable in a multiplicative form enables us to identify differences in market conduct between groups.[11]

In the first place, I define two groups, domestic and foreign chains, to examine the hypothesis that foreign chains are more aggressive in their pricing policies. To compare the level of competitive intensity between the two groups, I introduce a dummy variable and specify the model as

$$(3.13)\ p_{jrt} = \gamma_{jr} + \beta_1 wholesale_{jrt} + time'\beta_2 + \beta_3 chainsize_{jrt} + \Phi_1 \frac{1}{a}\frac{1}{(1-s_{jrt})} + \Phi_2 \frac{1}{a}\frac{Fordum}{(1-s_{jrt})} + \upsilon_{jrt}$$

where Fordum is the dummy variable, assigned a value of 1 for foreign chains and 0 otherwise. Φ_1 measures the market conduct of domestic chains. A significant estimate of Φ_2 implies different market conduct between the two groups, leaving an estimate of $(\Phi_1 + \Phi_2)$ for foreign chains. A negative sign of Φ_2 means that foreign chains have more competitive market conduct than domestic ones.

The same technique can be applied in examining the hypothesis that foreign chains place fiercer competitive pressure on domestic ones. The difference is to use a sub-sample consisting of only domestic stores and to redefine a dummy variable. The estimation equation is given as

$$(3.14)\ p_{jrt} = \gamma_{jr} + \beta_1 wholesale_{jrt} + time'\beta_2 + \beta_3 chainsize_{jrt} + \Phi_1 \frac{1}{a}\frac{1}{(1-s_{jrt})} + \Phi_2 \frac{1}{a}\frac{Dum1}{(1-s_{jrt})} + \upsilon_{jrt}$$

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[11] The assumption of the price response parameter being constant across markets, may be restrictive, even though we are looking at a city. The response to prices could be different according to region or income level. On the grounds of this, one might raise a doubt about the result. To test the possibility, I do a simple robust test as explained later.

where Dum1 is the dummy variable, assigned a value of 1 for a market where domestic firms face foreign competitors and 0 otherwise. Φ_1 measures the market conduct of domestic chains without foreign pressure. $(\Phi_1+\Phi_2)$ represents the competitive intensity of domestic chains facing foreign pressure. A negative sign of Φ_2 means that foreign chains force domestic chains to act more competitively.

I set up another model to test the third hypothesis, that markets with foreign chains are more competitive than those without foreign chains. The equation is given by

$$(3.15)\quad p_{jrt} = \gamma_{jr} + \beta_1 wholesale_{jrt} + time'\beta_2 + \beta_3 chainsize_{jrt} + \Phi_1 \frac{1}{a}\frac{1}{(1-s_{jrt})} + \Phi_2 \frac{1}{a}\frac{Mar1}{(1-s_{jrt})} + \upsilon_{jrt}$$

where Mar1 is a dummy variable, assigned a value of 1 for a market where foreign firms have their presence and 0 otherwise. Φ_1 measures the market conduct of markets with only domestic chains. $(\Phi_1+\Phi_2)$ represents the competitive intensity of markets with foreign presence. A negative sign of Φ_2 means that the competitive level of market with foreign chains is higher. Note that (3.15) is identical with (3.14) except that (3.15) employs a sub-sample consisting of domestic chains, while (3.14) uses the whole sample.

Lastly, I attempt to look into whether there is a difference between leading chains and others in their pricing behavior. The same methodology applies with a different dummy variable as below:

$$(3.16)\quad p_{jrt} = \gamma_{jr} + \beta_1 wholesale_{jrt} + time'\beta_2 + \beta_3 chainsize_{jrt} + \Phi_1 \frac{1}{a}\frac{1}{(1-s_{jrt})} + \Phi_2 \frac{1}{a}\frac{Leading}{(1-s_{jrt})} + \upsilon_{jrt}$$

where Leading is a dummy variable, assigned a value of 1 for the big four chains and 0 otherwise.[12] The interpretation is the same as the above. A negative sign of Φ_2 means that the leading chains are more competitive.

The conduct parameter above measures time-invariant overall competitive intensity. If time-variant factors have an effect on competitive intensity, the time invariant conduct parameter incorrectly estimates the true level of competitiveness. An examination of price data reveals a downward trend in prices over the sample period, suggesting there might be a increasing trend in competitive intensity. A likely explanation for the trend is as follows. The items in the sample fall within the categories of traffic builders which superstores sell at very low prices or prices that do not cover direct costs in order to attract customers. As Holton (1957) points out, it is an optimal strategy that superstores expand their product lines to non-food items with better margins to compensate for narrow margins on traffic builders. And the expansion of non-food items allows superstores to adopt more competitive prices on traffic builders. A couple of statistics can show the expansion of non-food product lines in the superstore industry. The proportion of food and beverages in total sales is in a steady decline with the growing importance of non-food items: 52.7 % in 2000, down to 48.8 % in 2002. And the number of products stocked in a superstore is increasing, from about 22,000 items in 2000 to 31,000 items in 2002.

Unfortunately, I could not observe the relative importance of non-food items. Instead, assuming the importance of non-food items is increasing over time, I

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[12] Leading chains include Emart, Lottemart, Tesco and Carrefour. I dropped Walmart from the leading group in that it has only a single store in Seoul, even though it is a leading chain nationwide

introduce a trend variable and create an interaction variable of the trend variable and market share. To check the effect of the expansion of non-food items on pricing policies, I add the interaction variable into model (3.12) through (3.16). Adding the variable in equation (3.12) gives

$$(3.17)\ p_{jrt} = \gamma_{jr} + \beta_1 wholesale_{jrt} + time'\beta_2 + \beta_3 chainsize_{jrt} + \frac{\Phi_1}{a}\frac{1}{(1-s_{jrt})} + \frac{\Phi_2}{a}\frac{Trend}{(1-s_{jrt})} + \upsilon_{jrt}$$

where Trend is a quarterly trend variable.

In passing, it should be noted that s_j is an endogenous variable, in that it is correlated with ν_{jr}. Therefore the instrumental variable estimation method is needed. The key issue in this model has been to find appropriate instruments for this endogenous variable. Berry (1994) suggested other firms' characteristics as cost-side instruments, while Nevo (2001) employed the prices of the same products in other markets. However, due to the nature of predetermined market shares data, which will be explained later, this study will employ the traditional OLS procedure.

3.4.3 The properties of the logit model

The demand specification above assumes that the utility function is additively separated into two parts: the mean utility (denoted as δ) determined only by product characteristics, and the error term (denoted as ε), which is identically and independently distributed across consumers and products with the extreme value function exp(-exp(-ε)). This specification leads to the well-known Independence from Irrelevant Alternatives (IIA) property.

With the logit specification, the ratio of market shares for any two alternative j and k is given

$$(3.18)\ \frac{s_j}{s_k} = \frac{\exp \delta_j / \sum_i \exp \delta_i}{\exp \delta_k / \sum_i \exp \delta_i} = \exp(\delta_j - \delta_k)$$

where $\exp(\delta_j - \delta_k)$ is the odds ratio. Note that the ratio does not depend on any alternatives other than j and k. In other words, no other alternatives or their characteristics enter the odds ratio. This implies that irrelevant alternatives cannot affect the relative odds of choosing j over k.

This IIA property is equivalent to imposing proportional substitution across alternatives (Train, 2003). Suppose another (irrelevant) alternative, say r, lowers its prices. Obviously, alternative r gains market share at the expense of other alternatives, including j and k. The IIA property requires the odds ratio to be constant before and after the change:

$$(3.19)\ \frac{s_j^{\,0}}{s_k^{\,0}} = \frac{s_j^{\,1}}{s_k^{\,1}}$$

where superscript 0 denotes market shares before the change, and 1 after the change. For the ratio to be constant, each market share changes by the same proportion.

The proportional substitution is manifested in terms of cross price elasticities. Using the well-known logit formula, the cross price elasticity is given by

$$(3.20)\ \mathrm{E}_{cross} = -\frac{\partial s_{jr}}{\partial p_{ir}} \frac{p_{ir}}{s_{jr}} = \alpha\, s_{ir} p_{ir}$$

where α is the price response parameter, p is the price and s is market share. Note that j does not enter the formula. Therefore, the cross elasticities of s_j with respect to

p_i are identical across all alternatives $j \neq i$. This means that all alternatives change by the same percentage. (Note that the cross price elasticity, by definition, is a percentage change in market share s_j induced by a percentage change in price p_i). However, in absolute terms, alternatives with larger market shares will change more than ones with smaller market shares.[13] The same issue arises when a new alternative is introduced into the market. The proportional substitution means that, due to a new entrant, incumbent alternatives lose their market shares by the same percentage. Again, alternatives with a larger market share are expected to suffer more.[14]

This IIA property is clearly unrealistic in many settings. Consider an example given by Berry et al. (1995). They suppose an automobile market with three brands of Mercedes, BMW and Yugo (an inexpensive car), where Mercedes and Yugo have the same market share. Then the IIA property predicts that an increase in the price of BMW brings the same increase in the demand for Mercedes and Yugo. This result is not compatible with the economic reality, where demand for Mercedes increases much more than demand for Yugo since Mercedes is closer to BMW in the product space. A similar contradiction happens when a new product (eg. Seat as

[13] Let us consider a simple example. Suppose there are three alternatives in a market: j, k and i. And suppose they currently account for 50, 30 and 20 per cent of the market respectively. Then suppose alternative i lowers its prices to gain an 8 % point increase in its market share. This means that alternatives j and k together lose 8 per cent of the market. By proportional substitution, then, alternatives j and k should lose their market shares by the same percentage, i.e., 10 per cent each. Therefore, the market share of alternative j drops from 50 per cent to 45 per cent, while that of alternative k decreases from 30 per cent to 27 per cent. Note that, in absolute terms, alternative j with a larger market share suffers from a heavier loss than alternative k with a smaller market share.

[14] Suppose there are two incumbent alternatives in a market, j and k, currently accounting for 70 and 30 per cent of the market respectively. Then suppose alternative i enters the market, to capture 20 per cent of the market. By proportional substitution, then, alternative j and k should lose their market shares proportionally, by 20 per cent each. Therefore, the market share of alternative j drops from 70 per cent to 54 per cent, while that of alternative k decreases from 30 per cent to 24 per cent. Note again that, in absolute terms, alternative j undergoes a heavier loss.

another inexpensive car) enters the market. But this property predicts an equal effect on Mercedes and Yugo, while we expect a greater effect on Yugos than on the more expensive Mercedes. With the existence of the outside good, which is normally set to have the largest market share among alternatives, the problem becomes worse. The IIA property means that the introduction of a new alternative, eg. Seat, draws more customers from those who do not purchase cars (the outside good) than from current customers for other cars. However, the reality is that Seats are likely to steal current customers purchasing similar models without generating new customers for cars.

However, the IIA property is likely to a large extent to reflect the economic reality in the superstore industry in Korea. First, when a new superstore enters a market, the substitution pattern matches that of the IIA property explained above. As mentioned earlier, the superstore industry has been expanding very rapidly along with a number of new entrants, while other formats of grocery stores, i.e. the outside alternatives, are still dominant, accounting for the largest market share in grocery shopping. When a new superstore opens nearby, it is the case that a large number of customers switch their place of grocery shopping from the outside alternatives to the superstore. A survey conducted by the Korea Chamber of Commerce and Industry in 2002 strongly evidences this tendency. It states that small grocery stores and conventional markets suffer from a 26 per cent drop in their sales when a new superstore opens nearby.[15] In short, a new superstore attracts a lot of new customers from the outside good with the largest market share, which fits into the IIA property.

[15] Fearing heavy losses in their sales, small grocery stores associations often organize campaigns or try to influence decisions of local governments against new superstores.

One might raise doubts over the use of the IIA property, on the grounds that when a new superstore enters or a superstore lowers its prices, the IIA property predicts greater effects on superstores with larger market shares, while it is reasonable to expect greater effects on superstores with similar characteristics. The most important characteristic of superstores in consumer choice is the location. According to a consumer survey conducted by AC Nielson Korea, consumers consider distances to superstores (40%) as the most important factor in choosing superstores to shop at, with prices (22%) recognized as the next important factor.[16] This is consistent with the conventional notion that grocery shopping falls within local markets. Based on the catchment area approach (explained later), this study identifies local markets in Seoul. By identifying local markets, we restrict substitution to happening among superstores within a local market. In this respect, this is similar to the idea of the nested logit model to deal with the restrictive substitution pattern of the logit model. With the fact that most superstores typically cluster together in the centre of local areas, I could go further, to argue that differences in distances to superstores greatly decrease within a local market.[17] To the extent that this argument, as well as greater effects on superstores with larger market shares, is not correct, the logit model is viewed as an approximation.

3.5 Market Definition and Data

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[16] See the Korea Business Newspaper (September 23, 2003).

[17] It is often said that there is less variations in quality or their formats among superstores in trade publications.

3.5.1 Product and geographical market definition

To evaluate the level of market competitiveness, we should first define relevant markets where market competition takes place, which, in turn, acts as a base for the calculation of market shares and other independent variables varying by markets. The US merger guidelines provide a useful paradigm for concepts in defining a relevant market. It is called a "hypothetical monopolist method", where the economic market is defined as the minimum number of products (a relevant product market) and the smallest geographical area (a relevant geographical market) in which a hypothetical profit-maximizing monopolist could impose a small but significant and non-transitory increase in price (hereafter SSNIP).

First consider a relevant product market in this context. The hypothetical monopoly test asks whether, in a defined group of products, a hypothetical monopolist could profitably impose a SSNIP. Since it is not easy to apply this test directly in practice, it is a conventional approach to look at the nature of demand as well as practices of suppliers. With the help of some evidence from these, I define grocery shopping in the superstore sector as the relevant product market, where a superstore is defined as a grocery store with more than 3,000 square meters of floor space. In the first place, the superstore sector provides consumers with a very distinctive shopping service: the purchase of a bundle of groceries in one visit, i.e. one-stop grocery shopping. Obviously, other formats of grocery stores, such as small grocery stores, convenience stores and conventional markets, could be alternatives

for grocery shopping. The first two types of grocery stores, however, cannot provide consumers with such one-stop shopping since they are too small. Huge differences in size strongly support this argument. In 2001, floor space of mid-sized grocery stores and convenience stores in Seoul was, on average, less than 600 m^2 and 100 m^2 respectively, while the average size of superstores exceeded 13,000 m^2. Although conventional markets are still important grocery shopping places, they cannot offer such a wide range of groceries and shopping quality as superstores do.

In addition, price monitoring programs run by superstores are other evidence for the argument that the superstore sector alone constitutes a relevant product market. To be price competitive compared to other superstores, they undertake monitoring of other superstores' prices. Along with this, they run programmes, where costumers can claim twice (or several) times the price they have paid if they should find cheaper products in other superstores. These practices suggest that superstores consider other superstores as direct competitors rather than other grocery stores. Based on similar reasoning and evidence, other studies (Cotterill, 1986, Smith, 2004, UK Competition Commission, 2000) define grocery shopping in the superstore sector as a product market. Cotterill's result shows that defining product markets broadly reduces the ability of the entire model in explaining pricing behaviour.

Now consider the definition of geographical markets. The hypothetical monopoly test asks whether, in a defined area, a hypothetical monopolist could profitably impose a SSNIP. In an economic sense, a geographical market should be defined from the viewpoint of consumers. If, given a defined geographical market, consumers could switch their grocery shopping to superstores in other areas in

response to a SSNIP, the defined geographical market should be enlarged and tested again until this switch does not happen. However, it is difficult to define a geographical market depending on the SSNIP test from the perspective of consumers, since it requires very rich data relating to consumers, which economists do not enjoy in most cases. Therefore, in practice, many researchers and antitrust authorities resort to a simpler method in delineating geographical markets: to take the catchment area approach or simply to employ existing statistical areas. Loosely speaking, UK Competition Commission (2000), Cotterill (1986), and FTC v. Staples case (1997) adopt the concept of a catchment area, while Lamm (1981) employs existing statistical areas. Typically, a catchment area is defined as an area falling within a certain distance (eg. a 3 km, or 15 minute drive) around a store, based on the consumers' shopping pattern, that they do not travel far away to shop for groceries. Without the two factors considered below, a catchment area could constitute a distinctive geographical market.

Two factors could make geographical definition of markets more complicated. First, pricing policies of superstores are an important factor in defining geographical markets. If superstores set prices uniformly across a nation or region, the economic market cannot be the local one as the catchment area approach assumes. Smith (2001) defines larger geographical markets than local catchment areas, taking account of the fact that supermarket chains do not set prices store by store but mostly on a regional basis. Secondly, as the UK Competition Commission (2000) points out, overlapping catchments could cause problems in defining the geographical market using the catchment area approach. If several catchment areas overlap, an SSNIP

causes a significant loss of demand, resulting in an unprofitable outcome. This means that the geographical market should be defined as a larger one. On the other hand, if overlapping is not significant, the loss of demand could be so small for a hypothetical monopolist to maintain the increased price. In this case, the catchment area can still constitute the economic market.

Basically, this study follows the catchment area approach. I define a catchment area as an area falling within 3 km around a store. According to the Korea Chain Store Association, superstores consider a 3 Km catchment area as their key market, since the majority of their customers come from within this area. In making a decision about entering a market, they tend to look at the 3 km catchment area closely. In this study, the pricing pattern of superstores does not make things complicated. For high-selling (or frequently purchased) items, at least, superstore operators in Seoul allow their stores to set prices on a store basis in order for each store to respond quickly to local demand and competitive circumstances. Examination of the data set shows that there are significant variations in prices across stores within a chain. However, the existence of overlapping catchment areas causes a problem. To address this, I define larger markets where catchment areas are overlapping. Based on this procedure, I identify 12 non-overlapping local markets. However, the geographical market definition is, by nature, arbitrary to some extent. To check the robustness of the geographical market definition, I try other geographical market delineations and re-estimate the models.

3.5.2 Data

This study looks into the grocery superstore sector in Seoul from Jan 2001 to Dec 2003. Based on the procedure explained in the previous section, I identify 12 non-overlapping local markets across Seoul. The sample covers two-thirds of superstores in Seoul. As of 2003, out of 45 superstores in Seoul, 30 superstores are included. Out of 30 superstores in the sample, 23 superstores belong to domestic chains while 7 superstores belong to foreign ones. On the other hand, 12 superstores are outlets of top 4 chains, while 18 superstores belong to smaller chains. The study uses monthly data. Table 3.4 summarizes the structure of the database.

[Insert Table 3.4 here]

For the estimation, we need data for following variables: prices and market shares, store and chain characteristics, wholesale prices and some dummy variables. These data are obtained from several sources. The data on prices are collected from the price levels in Seoul produced by the Seoul Metropolitan City (hereafter SMC). The data on store and chain characteristics are gathered from the Yearbook of the Distribution Industry (various editions) published by the Korean Chain Store Association (hereafter KCSA). Wholesale prices are collected from the Bank of Korea's wholesale prices index.

The price data needs more explanation, since they mainly determine the structure of the whole data set. SMC monitors the prices of 30 high-selling (or frequently purchased) groceries from 8 retail stores by every district on a monthly

basis, in order to check the cost of living across Seoul. The retail stores monitored include small grocery stores, convenience stores and department stores as well as superstores. SMC have changed the stores monitored from time to time, usually replacing small grocery stores with superstores to reflect the increasing importance of superstores in grocery shopping. Sometimes they drop superstores from the stores surveyed. Consequently, superstores have a different number of observations over time. That is, this characteristic of the price data constitutes an unbalanced panel for the whole data set.

Prices are defined as weighted average prices of several grocery items. Out of 30 items surveyed, 6 items[18] are chosen such that it is possible to compare the price levels across superstores and over time: instant noodles, packed milk, chocolate pies, tuna, flour and sugar. To aggregate the prices of these items, I use weights assigned to these items in the production of the Consumer Prices Index. Obviously, it is ideal to use shares of these goods in sales of superstores, which is not available in this study. However, the weights above might be reasonable proxies since they are constructed based on the importance of these goods in the household grocery expenditure. This is why SMC chooses these items to monitor the price levels in Seoul. The aggregated prices are deflated using the general consumer prices, and then indexed relative to the mean assigned a value of 100.

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[18] Out of 30 goods, I discard fresh food because it may be considerably variable in quality. Also, I have to exclude some products, regarding which it is not possible to compare prices due to discontinuity over time or across superstores. SMC sometimes changes the grocery items monitored over time or across districts.

Although they do not represent the general price level in a superstore, the aggregated prices can at least indicate the price level of high-selling items perceived by consumers. As said earlier, the study views as a product one-stop shopping in the superstore. By the nature of one-stop shopping, consumers are likely to be interested in the general price level of a basket of grocery shopping rather than the individual prices of each item. Of course, the aggregated price above is not an ideal proxy to represent the general level of prices in a superstore because items chosen are a small number of goods. These items, however, typically fall within the group of high-selling (or frequently purchased) items in the superstore, with their prices well exposed to consumers. Also, remember that they are representative grocery items in the household grocery expenditure. 30 items surveyed by SMC cover all the top 10 selling items in superstores, while 3 out of 6 items in the sample belong to the top 10 selling items.[19] In addition, they are the most popular national brands in each category. For these items usually called traffic builders, superstores employ distinctive pricing policies to attract customers by setting very low prices that do not cover direct costs in some cases (Competition Commission, 2000). As Holton (1957) argues, small or negative margins from traffic builders can be compensated for by large margins from other items, if there is strong complementarity between traffic builders and other items.

Direct sales data for these items or store traffic data are not obtained. Instead, market shares are calculated based on the parking space of superstores. By the nature

[19] According to Emart, the following items have been the top 10 selling goods in their stores for the last 10 years: nappies, beer, soju (an alcoholic beverage), instant noodles, milk, coke, chocolate pies, prawn-flavoured snacks, powdered milk, and detergents.

of one-stop shopping, consumers purchase a bundle of various groceries in one visit to a superstore, which typically involves the use of their cars. A consumer survey by AC Neilson Korea evidences this pattern: a car (63%) is a dominant mode of transportation to a superstore, followed by walking (25%) and public transportation (8%).[20] Accordingly we can expect sales in the superstore to be closely related to the availability of parking space. To check this out, I estimate the correlation between parking space and sales, using a data set of KSCA where store-level annual sales are available. As expected, the correlation ratio (0.70) is considerably high, which provides grounds to construct market shares based on parking space.

Calculating market shares involves a market share for the outside good. Usually, it is not easy to observe the market share of the outside good directly. Following Nevo's (2000) suggestion, therefore, I define the total size of a market and then subtract that of the inside goods from the total size of the market. I assume the total size of a market as the product of the number of households in a market and the average grocery expenditure per household, where the average grocery expenditure per household is obtained from the Korean National Statistics Office, household expenditure in cities. Then, in order to convert the total expenditure into the total size in terms of parking space, the total size is divided by the average sales per unit of parking space in Seoul, which are obtained from the data set of KSCA. While the total size minus combined parking space of superstores produces the market share of

[20] See the Korea Business Newspaper (September 23, 2003).

the outside good, market shares of inside goods are given as a proportion of their parking space to the total market size.

Although parking space is normally time invariant, the constructed market shares based on parking space could vary over time due to new entrants and exits. When new entrants or exits take place, I calculate market shares using the IIA property of the logit model. As said earlier, the IIA property predicts that all incumbent stores as well as the outside good will lose (or gain) their market share by the same percentage when new entry (or exit) takes place. This means that, in absolute terms, those with larger market shares will lose more than others with smaller market shares. This property is unrealistic in many settings. In the context of the superstore sector, however, the IIA property reflects the real world to a large extent: a new store steals more consumers from the outside good which has the largest market share in a market.

Note the fact that the constructed market shares do not vary unless new entry or exit happens. That is, by construction, the market shares are determined out of the system, that is, they are exogenous. As a result, we could say that the model examines how predetermined market structure affects prices. This result has a significant implication for the estimation methodology. With endogenous market shares, many studies take the instrumental variable estimation to obtain consistent estimators. By contrast, this study adopts the traditional OLS procedure since market shares are viewed to be predetermined. Relating to this point, one may argue that market shares are still endogenous since high prices attract new entrants. However, a superstore operator cannot enter a market immediately. It takes about one year from

a plan to enter a market to the completion of the entry. Considering the fact that this study employs monthly observations, it is reasonable to assume that entry decisions are predetermined before pricing decisions are made.[21]

A wholesale price is a weighted average of wholesale prices of the items concerned. The wholesale price for each product is collected from the Bank of Korea, and then is aggregated using the weights stated above. The aggregated wholesale prices are deflated using the general consumer prices, and then indexed relative to the mean assigned a value of 100. Note that the wholesale prices are constant across local markets, since Bank of Korea reports one time series across the nation. The size of a chain is measured by the number of stores within the chain in each month. To construct this, I use the opening dates of superstores, the information of which is obtained from KCSA. Due to the rapid expansion of superstore chains, we could see variations over time in the size of the chain.

In addition, several dummy variables are defined. To see how aggressive foreign firms are in pricing policies, I define a dummy variable, Fordum, which is assigned a value of 1 for a foreign superstore. Zero means a domestic superstore. Similarly, to examine how sensitively domestic firms react to the presence of foreign firms, I define another dummy variable, DUM1, where DUM1 is assigned a value of 1 for a market where domestic firms face foreign firms, and 0 otherwise. To see whether there are differences in market conduct between leading and small chains, I

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[21] On the other hand, current prices could have an effect on future market structure and thus future prices, which requires the explicit formulation of a dynamic framework. However, this study employs a static model, implicitly assuming that firms do not take account of the possible dynamic aspects in their pricing decisions. I leave this to future work.

define a dummy variable, Leading, which is assigned a value of 1 for the big four chains. As shown in Table 3.1, in the superstore sector, Emart, Lottemart, Tesco and Carrefour account for about 75 per cent of the market nationally. Zero means the rest of the chains. To control for cost differences, I introduce two time dummy variables, Time1 and Time2, where Time1 is assigned a value of 1 for year 2002 and Time 2 is assigned a value of 1 for year 2003. The base year is 2001. Lastly, 30 store-specific dummy variables are created to control for store-level heterogeneity.

Table 3.5 presents summary statistics for the major variables. The prices vary across markets and over time, while most variations in prices are due to variations over time. The wholesale prices vary over time and are constant across markets.[22] For the remaining variables, cross-sectional variations are dominant. The market share does not vary over time except when new entry or exit happens. Although the size of chain varies over time, differences between chains turn out to be very considerable.

[Insert Table 3.5 here]

3.6 The estimation results

Table 3.6 presents the results for several models of the pricing equation based on the identification of 12 local markets. The dependent variable is the weighted average price of 6 items for all the columns. Estimation of each model is

[22] Due to the nature of unbalanced panel data, wholesale prices have some variations across markets.

implemented using ordinary least squares (OLS) under the assumption of independently and identically distributed error terms. All the regressions include the store-specific dummy variables, which are not reported here. That is, the fixed effect methods are employed.

Column 1 refers to the result for the baseline model, where I measure the overall level of market competitiveness in Seoul. Most variables have the expected signs and are significant. The effect of the wholesale price is, as expected, significant, implying that superstores pass on about five-sixths of the increase in the wholesale prices to their retail prices. The coefficients on Time 1 and Time 2 show that other cost factors, such as labour and distribution costs, also have a significant effect on retail prices.[23] The coefficient of chain size has a negative sign as expected, but is not significant.

The estimated coefficient on market share needs more explanation. As said earlier, the coefficient on market share is the conduct parameter divided by the price response parameter, ϕ / α. Without information on the price response parameter, therefore, we could not identify the conduct parameter separately.[24] Note that, in the logit formulation, the store-level price elasticity is given by $\varepsilon = \alpha p(1 - s_i)$, where α is the price response parameter, p is the price and s_i is the market share. It should be noted that we are considering the store-level price elasticity rather than the market-level price elasticity.[25] Once we have the information on the price elasticity, we can

[23] Certainly, the time dummy variables could pick up time-varying factors other than the cost factors.
[24] The joint estimation of the pricing equation with the demand system can separate the conduct parameter. However, the simultaneous estimation is not possible here, since the market share variable predetermined by the nature of construction cannot be the dependent variable in the demand equation.

deduce the value of the price response parameter using the formula. Since I can neither estimate the price elasticity due to data limitation nor find it from previous studies, I have no choice but to rely on a rough guess on the value of the price elasticity.

The standard micro-economic theory predicts that the store-level price elasticity is larger than the conduct parameter whose value could be any non-negative number as explained earlier in (3.10).[26] When the price elasticity is 1, the corresponding price response parameter should be 0.0091, evaluated at the sample means. With the estimated coefficient on the transformed market share, i.e. ϕ/α, being 22.3, then, the conduct parameter becomes 0.202. Likewise, in the case that the price elasticity is 2, 3, 4 and 5, the conduct parameter should be 0.405, 0.608, 0.813 and 1.014 respectively. Table 3.7 summarizes the explanations above. A demand elasticity of 5 implies that a 5 percent increase in prices results in a 25 percent decrease in quantity demanded. Where quality differences are not large just as in the Korean grocery superstore sector, a demand elasticity of 5 is expected to produce few differences in prices among grocery superstores. Given the significance price dispersion found in the sample[27], therefore, it is not unrealistic to assume that the

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[25] The market-level price elasticity for grocery shopping may be less than 1, reflecting inelastic demand of grocery shopping. However, the store-level demand elasticity should be larger than the market-level demand elasticity.

[26] Suppose superstores set prices rather than quantity. At the equilibrium, the marginal revenue should be equal to the marginal cost. With simple manipulation, this condition is given as

$$mr = p(1 - \frac{\Phi}{\varepsilon}) = mc$$

where ε is the store-level price elasticity of demand and Φ is the conduct parameter. Since the marginal cost is positive, the marginal revenue should be positive as well, which requires that the price elasticity should be larger than Φ.

[27] As of Dec 2003, for example, the prices range from 95.9 to 102.6, where the prices are normalized.

price elasticity is less than 5. Even with the price elasticity at 5, the estimated conduct parameter is nearly equal to 1, indicating the Bertrand competition.

Columns 2 to 5 in Table 3.6 investigate whether there exist differences in market conduct between groups of stores. One of main questions in the study is whether foreign stores are more aggressive in their pricing strategies compared to their domestic counterparts. Model 2 examines the question by including a variable of FCMS, which is defined as the product of Market share and a dummy variable assigned 1 for foreign stores and 0 otherwise. The estimated coefficients are almost identical to those from the baseline model, except on Market share and FCMS. As said earlier, the coefficient on Market share measures the market conduct of domestic stores, while that on FCMS measures the relative competitiveness of foreign stores. The coefficient on FCMS is not significant, suggesting that there is no significant difference in the pricing strategies between these two groups.

The model of column 3 deals with the second question, whether domestic stores sensitively respond to the presence of foreign stores. Note that this model uses observations only from domestic stores and that it includes a variable of DCMS, which is defined as the product of Market share and a dummy variable assigned a value of 1 for a store facing foreign competition and 0 otherwise. The coefficients other than on Market share and DCMS follow a similar pattern to the baseline model (or model 2), even though the coefficient on chain size turns out to be very significant. Both of the coefficients on Market share and DCMS are insignificant. This result rejects the hypothesis that domestic stores respond more sensitively to foreign competitors than to domestic competitors.

Column 4 refers to the third hypothesis, that markets with foreign presence are more competitive than other markets with only domestic chains. To this end, I include a multiplicative form of variable, MFMS, which is the product of Market share and a dummy variable assigned 1 for markets with foreign firms and 0 otherwise. The results are not different from models 2 or 3. The key coefficient on MFMS is not significant, rejecting the hypothesis. Relying on the results from columns 2 and 4, I conclude that foreign firms make no differences in the price competition.

Column 5 examines the hypothesis that leading chains are different from other chains in their pricing strategies. The result is interesting, especially the coefficients on Market share and BFCM. Note that BFCM is the product of Market share and a dummy variable assigned a value of 1 for leading chains and 0 otherwise. The coefficient on Market share measures the competitive level of the base group, i.e. small chains, while the coefficient on BFCM reflects the relative competitiveness of the leading chains compared to the base group. The estimated coefficient on BFCM has a large value with significance, implying a large difference in pricing behaviour between the two groups.[28] Taking into account the fact that the leading chains consist of local and foreign giants, this finding also supports the argument that foreign firms make no difference in the price competition. It appears that characteristics other than firms' nationality are more important in explaining pricing behaviour. The point

[28] As Holton (1957) points out, retail margins on food are narrow, which forces superstores to expand their product lines to more lucrative ones. In the sample, the average floor space of leading chains is found to be larger than that of other chains by more than 2,000 square meters, suggesting leading chains seek more extensive product lines. It means that they may have strong motivation to increase store traffic through lowering the prices of loss leaders more.

estimates of coefficients on Market share and BFCM have very large values. This may be due to large standard errors, which are not surprising given small variations in market shares. Remember that market shares in the data set vary only when new entry or exit takes place.

[Insert Table 3.6 here]

[Insert Table 3.7 here]

Table 3.8 reports the results when a trend interaction variable is added to the models in Table 3.6. As said earlier, the trend interaction variable surrogates the growing importance of non-food product lines in superstores sales. The coefficient is very significant with a negative sign across models, strongly suggesting superstores are adopting more aggressive pricing on loss leaders as non-food items increase. The addition of the trend variable does not change the main results: still, foreign firms have no significant effect on price competition. It should be noted that with the addition of the trend variable, the magnitude of the conduct parameter has decreased and the difference between leading and small chains becomes insignificant (just beyond 10% level). However, as we will see in Table 3.9, the difference between them remains significant in high-selling items.

[Insert Table 3.8 here]

Tables 3.9 and 3.10 display the results for subsets of items. The aim is to examine further the hypothesis that superstore chains set prices low for loss leaders. Depending on the weights given to these items in the construction of the consumer prices index, I separate 6 items into 2 subsets of items, high-selling and less high-selling items.[29] Table 3.9 reports the results for the first group, while Table 3.10 shows the results for the second group. The results for the high-selling items in Table 3.9 are very similar to those in Table 3.6. Foreign firms appear to have no significant effect on price competition. And the market leaders seem to be more aggressive in their pricing policies than the other chains. The difference is that the estimated coefficient on market share becomes insignificant with a smaller value, suggesting that superstores set very competitive prices for the high-selling items.

The second group in Table 3.10 presents more interesting results. First, the coefficient on Market share in column 1 has a larger value with higher significance, strongly indicating that superstores charge less competitive prices for the less high-selling items so as to earn higher margins. Secondly, the different pattern between the market leaders and the other chains suddenly disappears. As presented in column 4, the coefficient on BFCM is not significant, although it has a negative sign as in other models. It does not appear that the leading chains set significantly lower prices from the other chains for these items. This finding is consistent with the argument that superstores compensate for small margins on loss leaders with larger margins on

[29] The first group includes milk, Korean instant noodles, tuna, and chocolate pies, while the second group consists of sugar and flour.

other items. In passing, note that foreign chains are still not different from domestic ones in the pricing policy for any subset of items.

[Insert Table 3.9 here]

[Insert Table 3.10 here]

Tables 3.11 and 3.12 experiment with whether the results are robust to changes in the geographical market definition. As said earlier, the local market definition necessarily involves arbitrariness to some extent. To examine this, I re-estimate the models using other local market definitions. Table 3.11 is based on smaller local markets, while the models in Table 3.12 are estimated using larger local markets. The main results remain unchanged: there is no significant difference in the market conduct between domestic and foreign firms, while, in contrast, there appears a considerable difference between the leading chains and small chains. We can see that, in the case of 9 local markets, the coefficients on Market share and BFCM have a larger value compared to those in the smaller market definition. This can be explained. The larger local markets decrease variations in the market share compared to the smaller market definition. Given the prices, smaller variations in the market share, in turn, produce a larger coefficient on Market share. Based on the evidence found in the several publications published by the Korean Chain Store Association, I prefer the 12 local markets definition to others.

[Insert Table 3.11 here]

[Insert Table 3.12 here]

Table 3.13 checks whether the price response parameter varies across regions. Remember that I rely on the assumption that the price response parameter is constant across markets in order to compare the market conduct between groups. However, the price response parameter may vary according to the level of household income or region. To test this, I construct a simple version of the model, where I include regional dummy variables to reflect the different levels of income or regions. In column 1, I divide Seoul into three regions based on the number of car owners, while, in column 2, I use the geographical proximity to form three regions. The idea of this test is as follows. If there exists a significant difference in the price response parameter across regions, the coefficients on the regional dummies are expected to be significant.[30] Table 3.13 shows that the coefficients are not significant, suggesting the price response parameter is not significantly different across regions.

[Insert Table 3.13 here]

3.7 Conclusion

In this research, I empirically investigate the popular notion that foreign firms as newcomers increase price competition. To this end, I test three hypotheses:

[30] Apparently, even if the price response parameter varies according to the level of income or regions, there is a possibility that differences in the market conduct cancel out differences in the price response parameter. To that extent, this test is not robust.

(1) foreign firms are more aggressive in their pricing policy; (2) domestic firms play more competitively where they face foreign firms; and (3) markets with foreign firms are more competitive compared to markets with only domestic firms. In addition, to check other factors in the pricing behaviour, I develop another hypothesis, that leading chains are different from small chains in their pricing policy. The unique development of the Korean superstore industry allows us to empirically examine these hypotheses. Since the prohibition of foreign entry was lifted in 1996, the superstore industry has experienced a large influx of foreign direct investment. This produces significant time series variations in foreign firms' presence, even over a short period of time along with cross-sectional ones, which provides the ground on which to construct market shares based on parking space. For the estimation, I construct a reduced form pricing equation using a simple logit model. I then measure the level of competitiveness and compare the levels between groups of superstores.

Unlike the previous studies, the results do not support the popular notion that foreign firms increase price competition: there is no significant difference in pricing behaviour between the foreign and domestic chains; domestic chains are not likely to react sensitively to the presence of foreign competitors; and there is no evidence that markets with foreign firms are more competitive than those without foreign ones. Interestingly, it seems that leading chains undertake more competitive pricing policies than small chains, especially in high-selling items. Given that the leading chains consist of foreign and domestic retail giants, this evidence also supports the conclusion that foreign firms have no significant effect on price competition. In conclusion, the results indicate no existence of difference or rivalry between local

and foreign firms, strongly indicating the alternative view that foreign firms are expected to behave as a member of an oligopoly group instead of as mavericks.

More examination of sub-samples of items supports Holton's argument: superstore chains charge competitive prices for high-selling items, while less competitive prices for less high-selling items. Leading chains seem to be more engaged in this practice. They set more competitive prices for the high-selling items than small chains do. However, the difference between leading and small chains disappears in the less high-selling items.

To obtain more general conclusions relating to this issue, more studies are needed. First, this study uses a small number of items, most of which are believed to be sort of (so-called) traffic builders, limiting the generalization of the results. Estimating a larger number of items might produce different results from this study. Particularly for non traffic builders, less exposed to price competition, superstore chains might adopt different pricing policies. Secondly, I employ a reduced form pricing equation, assuming a simple logit demand, that is, a homogeneous consumer response to prices and no interaction between consumer and product characteristics. With the help of rich data on market share and consumer characteristics, future work needs to relax this assumption, estimating jointly the pricing and demand equation.

Appendix

Table 3.1. Superstores: Number of Outlets and Turnover

	93	94	95	96	97	98	99	2000	2001	2002
Number	1	4	17	27	47	68	94	135	176	222
Emart	1	2	4	6	9	13	19	27	41	50
Lottemart	-	-	-	-	1	4	8	16	23	31
Tesco	-	-	-	-	1	1	2	7	14	21
Carrefour	-	-	-	3	3	6	11	19	21	24
Walmart	-	-	-	2	4	4	5	6	9	15
Others	-	2	13	16	29	40	49	60	68	81
Turnover[1]	-	-	0.6	1.8	3.1	4.9	7.5	10.5	13.8	17.3
Emart	-	-	-	-	-	-	1.5	2.9	4.1	5.6
Lottemart	-	-	-	-	-	-	0.6	1.1	1.6	2.3
Tesco	-	-	-	-	-	-	0.4	0.6	1.5	2.4
Carrefour	-	-	-	-	-	-	0.9	1.1	1.5	2.0
Walmart	-	-	-	-	-	-	-	0.4	0.6	0.7

1. Trillion Korean won

Source: Korean Chain Store Association and Korea National Statistical Office

Table 3.2. Superstores: Number of Outlets and Turnover in Seoul

	98	99	2000	2001	2002	2003
Number	14	20	29	38	41	45
Foreign ones	1	3	6	10	10	14
Turnover[1]	1.1	1.7	2.5	3.2	4.0	4.4

1. Trillion Korean won

Source: Korean Chain Store Association and Korea National Statistical Office

Table 3.3. Several statistics relating to superstores in Korea

	2000	2001	2002
Gross margin (%)	14.8	15.9	16.1
Operating profit (%)	3.7	3.7	2.2
Average floor size	10,859	13,550	12,522
The number of items stocked	21,766	25,494	31,303

Source: Korea Chamber of Commerce and Industry

Table 3.4. The Structure of the Sample

Sample period	2001 Jan – 2003 Dec
Region studied	Seoul in Korea
Local markets defined	12 non-overlapping markets in Seoul (9 or 14 local markets definition is tried as a robust test)
Number of entire stores in Seoul as of Dec 2003	45
- Domestic vs Foreign	31 vs. 14
- Leading chains vs Small chains	28 vs 17
Number of sample stores as of Dec 2003	30
- Domestic vs Foreign	23 vs 7
- Leading chains vs Small chains	12 vs 18

Table 3.5. Data description

	Mean	Std.Dev	Min	Max	Store Variation	Month Variation
Prices	100	2.64	79.55	109.22	26.9%	73.1%
Wholesale Prices	100	1.39	97.28	103.15	-	93.8%
Market shares	0.087	0.078	0.008	0.30	99.5%	0.5%
Chainsize	20.4	16.7	1	58	97.5%	2.5%

* These results are based on the identification of 12 local markets.

Table 3.6 Results for the effect of foreign firms on price competition (1)

	Time invariant conduct model				
	1	2	3	4	5
Wholesale	0.84*** (13.30)	0.84*** (13.29)	0.75*** (16.05)	0.84*** (13.32)	0.84*** (13.41)
Time 1	0.82*** (2.86)	0.81*** (2.84)	1.09*** (5.35)	0.82*** (2.86)	0.87*** (3.05)
Time 2	0.59* (1.81)	0.60* (1.83)	0.33 (1.42)	0.65** (1.96)	0.79** (2.32)
Chain size	-0.51 (-1.34)	-0.52 (-1.38)	-1.00*** (-3.52)	-0.56 (-1.47)	-0.74* (-1.87)
Market share	22.3** (1.96)	18.6 (1.54)	-2.89 (-0.29)	11.9 (0.84)	85.0** (2.57)
MSTrn					
FCMS		26.12 (0.90)			
DCMS			13.69 (0.84)		
MFMS				25.8 (1.24)	
BFCM					-69.8** (-2.01)
Adj. R^2	0.4445	0.4444	0.5814	0.4451	0.4476
No of obs.	591	591	468	591	591

* The dependant variable is the weighted average prices of 6 items. All models include store specific dummy variables, which are not reported here. Here, Market share=1/(1-Si), FCMS=Fordum*1/(1-Si), DCMS=Dum1*1/(1-Si), MFMS=Mar1*1/(1-Si), and BFCM=Leading*1/(1-Si).

Table 3.7. Conduct parameter

Price elasticity E	E=1	E=2	E=3	E=4	E=5
Price response parameter α	0.0091	0.0182	0.0273	0.0365	0.0455
Conduct parameter ϕ	0.202	0.405	0.608	0.813	1.014

* Note that the calculation is based on the coefficient on Market share being 22.3 and that the price response parameter is evaluated at the sample means.

Table 3.8 Results for the effect of foreign firms on price competition (2)

	Time variant conduct model				
	1	2	3	4	5
Wholesale	0.85*** (13.52)	0.84*** (13.51)	0.76*** (16.74)	0.85*** (13.55)	0.85*** (13.60)
Time 1	1.90*** (4.53)	1.89*** (4.51)	2.19*** (7.11)	1.90*** (4.53)	1.88*** (4.49)
Time 2	2.51*** (3.94)	2.52*** (3.94)	2.29*** (4.79)	2.57*** (4.02)	2.56*** (4.01)
Chain size	-0.005 (-0.01)	-0.02 (-0.05)	0.6** (-2.10)	-0.05 (-0.14)	-0.22 (-0.52)
Market share	18.9* (1.67)	15.4 (1.28)	-6.89 (-0.70)	8.5 (0.61)	69.3** (2.09)
MSTrn	-0.25*** (-3.49)	-0.25*** (-3.48)	-0.25*** (-4.68)	-0.25*** (-3.49)	-0.23*** (-3.27)
FCMS		25.1 (0.88)			
DCMS			13.4 (0.85)		
MFMS				25.8 (1.25)	
BFCM					-55.9 (-1.61)
Adj. R^2	0.4555	0.4553	0.6003	0.4561	0.4571
No of obs.	591	591	468	591	591

* The dependant variable is the weighted average prices of 6 items. All models include store specific dummy variables, which are not reported here. Here, Market share=1/(1-Si), MSTrn = Trend*1/(1-Si), FCMS=Fordum*1/(1-Si), DCMS=Dum1*1/(1-Si), MFMS=Mar1*1/(1-Si), and BFCM=Leading*1/(1-Si).

Table 3.9 Regressions using a subset of items (1)

	4 items			
	1	2	3	4
Wholesale	0.80*** (12.46)	0.80*** (12.43)	0.80*** (12.45)	0.80*** (12.53)
Time 1	2.03*** (4.74)	2.02*** (4.71)	2.02*** (4.74)	2.02*** (4.7)
Time 2	2.75*** (3.91)	2.56*** (3.90)	2.60** (3.96)	2.63*** (4.00)
Chain size	0.07 (0.17)	0.06 (0.14)	0.03 (0.07)	-0.16 (-0.36)
Market share	16.0 (1.32)	14.0 (1.08)	5.64 (0.37)	71.9** (2.01)
MSTrn	-0.23*** (-3.05)	-0.23*** (-3.03)	-0.23*** (-3.02)	-0.21*** (-2.83)
FCMS		13.4 (0.45)		
MFMS			24.9 (1.15)	
BFCM				-62.0* (-1.66)
Adj. R^2	0.3983	0.3975	0.3986	0.4001
No of obs.	620	620	620	620

* The dependant variable is the weighted average prices of 4 items. All models include store specific dummy variables, which are not reported here. Market share=1/(1-Si), MSTrn = Trend*1/(1-Si), FCMS=Fordum*1/(1-Si), DCMS=Dum1*1/(1-Si), MFMS=Mar1*1/(1-Si), and BFCM=Leading*1/(1-Si).

Table 3.10 Regressions using a subset of items (2)

	2 items			
	5	6	7	8
Wholesale	0.73*** (11.33)	0.73*** (11.33)	0.76*** (11.33)	0.73*** (11.31)
Time 1	-0.42 (-0.70)	-0.41 (-0.69)	-0.41 (-0.82)	-0.41 (-0.69)
Time 2	0.76 (0.85)	0.76 (0.85)	0.72 (0.80)	0.75 (0.84)
Chain size	-1.42** (-2.55)	-1.41** (-2.53)	-1.37** (-2.45)	-1.38** (-2.35)
Market share	33.8** (2.09)	35.5** (2.07)	43.9** (2.16)	25.3 (0.53)
MSTrn	-0.48*** (-4.83)	-0.48*** (-4.82)	-0.49*** (-4.83)	-0.49*** (-4.80)
FCMS		-11.9 (-0.28)		
MFMS			-24.3 (-0.82)	
BFCM				9.45 (0.19)
Adj. R^2	0.6533	0.6528	0.6531	0.6528
No of obs.	653	653	653	653

* The dependant variable is the weighted average prices of 2 items. All models include store specific dummy variables, which are not reported here. Market share=1/(1-Si), MSTrn = Trend*1/(1-Si), FCMS=Fordum*1/(1-Si), DCMS=Dum1*1/(1-Si), MFMS=Mar1*1/(1-Si), and BFCM=Leading*1/(1-Si).

Table 3.11. Regressions based on an alternative geographical market definition (1)

	14 local markets				
	1	2	3	4	5
Wholesale	0.84*** (13.41)	0.84*** (13.40)	0.76*** (16.84)	0.84*** (13.40)	0.85*** (13.56)
Time 1	1.67*** (4.02)	1.67*** (4.02)	2.16*** (7.07)	1.67*** (4.04)	1.71*** (4.14)
Time 2	2.12*** (3.33)	2.13*** (3.34)	2.32*** (4.86)	2.15*** (3.37)	2.26*** (3.55)
Chain size	-0.05 (-0.13)	-0.03 (-0.09)	-0.56* (-1.95)	-0.11 (-0.27)	-0.35 (-0.83)
Market share	20.6** (2.24)	23.1** (2.12)	-4.71 (-0.48)	9.81 (0.69)	82.7*** (2.92)
MSTrn	-0.19*** (-2.73)	-0.19*** (-2.74)	-0.24*** (-4.56)	-0.19*** (-2.71)	-0.17*** (-2.49)
FCMS		-7.59 (-0.42)			
DCMS			28.3** (2.10)		
MFMS				17.4 (1.02)	
BFCM					-68.4** (-2.31)
Adj. R^2	0.4534	0.4525	0.6045	0.4534	0.4576
No of obs.	591	591	468	591	591

*The dependant variable is the weighted average prices of 6 items. Columns 1 to 5 report the results for 14 local markets. All models include store specific dummy variables, which are not reported here. Market share=1/(1-Si), MSTrn = Trend*1/(1-Si), FCMS=Fordum*1/(1-Si), DCMS=Dum1*1/(1-Si), MFMS=Mar1*1/(1-Si), and BFCM=Leading*1/(1-Si).

Table 3.12. Regressions based on an alternative geographical market definition (2)

	9 local markets				
	6	7	8	9	10
Wholesale	0.85*** (13.59)	0.84*** (13.57)	0.76*** (16.66)	0.85*** (13.58)	0.86*** (13.73)
Time 1	1.97*** (4.69)	1.97*** (4.68)	2.22*** (7.20)	1.98*** (4.71)	1.97*** (4.71)
Time 2	2.65*** (4.09)	2.65*** (4.09)	2.34*** (4.81)	2.67** (4.12)	2.72*** (4.19)
Chain size	-0.05 (-0.14)	-0.05 (-0.14)	-0.64** (-2.14)	0.01 (0.04)	-0.30 (-0.73)
Market share	33.8* (1.71)	33.1 (1.49)	-58.3 (-0.80)	99.2 (0.95)	113.0** (2.44)
MSTrn	-0.26*** (-3.58)	-0.26*** (-3.58)	-0.26*** (-4.77)	-0.26*** (-3.58)	-0.24*** (-3.27)
FCMS		2.76 (0.06)			
DCMS			60.56 (0.85)		
MFMS				-65.8 (-0.64)	
BFCM					-93.2* (-1.89)
Adj. R^2	0.4559	0.4549	0.6012	0.4553	0.4584
No of obs.	591	591	468	591	591

*The dependant variable is the weighted average prices of 6 items. Columns 1 to 5 report the results for 9 local markets. All models include store specific dummy variables, which are not reported here. Market share=1/(1-Si), MSTrn = Trend*1/(1-Si), FCMS=Fordum*1/(1-Si), DCMS=Dum1*1/(1-Si), MFMS=Mar1*1/(1-Si), and BFCM=Leading*1/(1-Si).

Table 3.13. Regressions for simple tests on the price response parameter

	1	2
Wholesale	0.85*** (13.56)	0.85*** (13.56)
Time 1	1.90*** (4.53)	1.90*** (4.53)
Time 2	2.56*** (3.98)	2.57*** (4.00)
Chain size	-0.04 (-0.10)	-0.05 (-0.14)
Market share	46.6 (1.29)	39.2 (1.47)
MSTrn	-0.25*** (-3.46)	-0.25*** (-3.46)
REG1MS	-38.6 (-1.02)	-31.3 (-1.06)
REG2MS	-13.8 (-0.34)	-5.80 (-0.17)
Adj. R^2	0.4554	0.4554
No of obs.	591	591

* The dependant variable is the weighted average prices of 6 items. The regressions include the store specific dummy variables, which are not reported here. MSTrn= Trend*1/(1-Si), REG1MS=REG1*1/(1-Si), and REG2MS=REG2*1/(1-Si).

Chapter 4

Foreign Firms and Entry Decisions in the Korean Grocery Superstore Industry

4.1 Introduction

In the preceding chapters, I examined the nature of price competition between domestic and foreign firms. Although price competition is one of the most important aspects in competition, firms operating in oligopolistic markets are well-known for employing a number of strategies in competing with their rivals. They may concentrate on non-price strategies, such as advertising and product quality, rather than on fierce price competition which might lead to a worst situation where all firms involved are losing profits. That is, there is possibility that domestic and foreign firms have several ways to relax price competition. In chain-store industries like supermarkets, restaurants, and clothes stores, where a number of stores are run under common ownership or management, the decision to enter a market or not can be one of the most important choices in competing with rivals. In these industries, markets are, in nature, localized, so that they face a situation to decide where to open outlets among a number of local markets which are different in demand and competitive circumstances. While profits, prices or costs are normally not observable,

we can observe entry decisions made by firms. With the introduction of an assumption that entry decisions are made based on the post-entry profits firms expect to earn given market and competitive conditions, then we can infer the nature of underlying competition from the entry decisions.

The Korean grocery superstore industry provides an ideal context to explore the nature of competition between domestic and foreign firms from their entry decisions. First, this industry is very fast developing through aggressive expansion, which enables us to observe a number of entries in a short period of time. Since 1996 when legal restrictions against foreign entries were lifted, several foreign chains quickly became major players against domestic rivals through building up their chain networks organically. Another attractive feature is that the industry is dominated by several chains, two domestic and three foreign retail giants. Combined, they account for 80 per cent of the market and about 80 per cent of new entries during the sample period. Hence this study focuses on these five chains' entry behaviour. A point to note is that the leading chains started to build their networks at nearly the same time. Out of five leading chains, four chains entered the industry in 1996 or 1997, when the first chain operator had only six stores. Therefore, there is little possibility that simply being early or late entrants makes different entry patterns.

Another advantage is that the availability of firm-level data allows us to look at entry decisions on a firm basis. Due to the lack of entry occurrences in many empirical settings it is common to base the estimation on pooled data of many firms or market-level data, implicitly assuming that entry behaviour is the same (or very similar) between firms. However, it is more reasonable to assume that each firm may

have its own entry strategy or behaviour, that is, to allow for asymmetry in entry behaviour between different firms. In addition, this study can exploit the information on *de novo* entries. This aspect also differentiates itself from many studies which examine entry decisions using existing market structure rather than new entries. A related issue is the treatment of existing stores. While many studies treat existing stores as identical to new entries with the assumption that firms decide to continue existing stores every period, this study counts only *de novo* entries and considers existing stores as predetermined. This feature is similar to Toivanen and Waterson (2001) and Cotterill and Haller (1992). Given the fact that closing existing stores is a very rare event and involves huge sunk costs, the different treatment between *de novo* entries and existing stores is more reasonable in this industry.

A number of recent studies have empirically examined firms' entry decisions by using discrete choice models. In particular, Bresnahan and Reiss (1990 and 1991) construct and estimate discrete choice models by explicitly introducing a game theoretic framework. They show that a simultaneous move game even with two potential entrants can fail to produce a unique equilibrium, which makes meaningful estimation impossible. They propose two main solutions to secure a unique equilibrium. The first one is to model entry decisions on the equilibrium number of entering firms, which is unique. As Berry (1992) shows, however, the computational burden makes this approach unavailable where more than two potential entrants are involved. As a special case, it is possible to estimate the model where a restrictive error structure is imposed like Manuszak (2002) and Chevalier (1995). A popular alternative is to introduce a sequential move game to eliminate a situation where

multiple equilibria arise. If firms make entry decisions sequentially, early movers can claim markets where either firm can earn profits, eliminating the case of multiple equilibria. In constructing an estimation model, therefore, many empirical studies (Mazzeo, 2002, Seim 2002, and Toivanen and Waterson 2001), including Bresnahan and Reiss (1990), examine two (two types of) potential entrants or introduce the concept of a sequential move game.

Following many studies, this study introduces a sequential move game concept: larger chains are assumed to move first and smaller chains follow next, which implies that two domestic firms move first with three foreign firms following. The order of entry above is motivated by the reasoning that large chains may be a natural consequence of early mover's advantages. The fact that domestic firms as long-serving retail giants in the retail industry hold most monopoly markets also helps to justify the assumption. To check the robustness of the entry assumption, alternative orders of entry are tested, finding similar results. A sequential move game entails an endogeneity problem in the leaders' estimations. Following Toivanen and Waterson (2000 and 2001), to deal with this, this study constructs leaders' conjectures on followers' optimal responses by using a simulation technique. While they model on a duopoly, this study extends the method to an oligopoly industry.

For the test, I set up two hypotheses: (1) firms may care about how many competitors they will face after entry, that is, whether they are concerned with overall market structure in their entry decisions, as the traditional wisdom of industrial organization expects; and (2) firms may be more concerned with which competitors they will face, that is, there could be a more intense rivalry between a

certain group of firms, like foreign and domestic firms. The estimation strategy is as follows. For the first hypothesis, I estimate the latent regression of entry decisions on the number of competitors by firm. Then I compare entry patterns between domestic and foreign chains to see how different they are. Second, to see how intense rivalry between them evolves after foreign entry, I check how they react to foreign and domestic rivals' presence.

The estimation result on pooled data is that firms avoid the presence of competitors, consistent with the traditional wisdom of industrial organization that an increasing number of rivals decrease firms' profits. Closer examination of each chain, however, presents a different story. Sharp asymmetry is found in entry behaviour between local and foreign firms. While domestic chains avoid entering markets with a growing presence of rivals, foreign firms do not care about how many competitors they will face after entry. That is, overall market structure matters for domestic chains but not for foreign chains. However, further experiments do not suggest intense rivalry between them. Instead, three large chains are found to react to each other sensitively, strongly suggesting the existence of intense rivalry between them. Again the results support the alternative argument, that the oligopolistic consideration is a dominant factor in competition. The finding that foreign firms care less about overall market structure may simply imply that they have a more optimistic view of post-entry profits or they prefer established markets to new ones.

The chapter is organized as follows. Section 2 discusses the estimation strategy and modelling issues. Section 3 presents the data and background

information about the Korean grocery superstore industry, with some descriptive statistics. Section 4 covers the estimation results, while Section 5 concludes.

4.2. The empirical Model

This paper builds a discrete choice model where entry decisions made by grocery superstore chains are related to market and firm characteristics. Like many studies on firms' entry, profits, prices or costs are assumed to be unobservable directly. Instead, I assume that we can observe entry decisions made by superstore chains, along with the information about potential entrants. That is, we have the information about who are potential entrants, and whether a potential entrant enters a certain market in a given time. A firm is assumed to make entry decisions based on the post-entry profits which they expect given the nature of post-entry competitive, and demand and cost conditions. If the expected profit is positive they enter, and otherwise they do not. With the introduction of this assumption, we could draw inferences about entrants' profits and market competition from the information about entry decisions. In other words, the qualitative information on entry decisions can reveal the nature of underlying market competition between domestic and foreign chains.

4.2.1. A traditional entry model

Traditional entry studies like Cotterill and Haller (1992) borrow the basic idea of a single-person qualitative choice model. In examining labour force participation by individuals, for example, researchers cannot directly measure the level of utility each individual derives from alternative choices. They can observe only whether individuals enter a job market or not. In constructing a model, therefore, they utilize a standard latent variable technique. They view the utility level as an unobservable variable formulated as a function of explanatory variables. The observation rule is set such that if the level of utilities achieved by participating in the labour market is larger than a certain threshold, people enter a labour market, and not if less than the threshold. The assumption on the distribution of the error term completes the modelling. Then the estimation reveals the relationship between the latent utility and explanatory variables.

The traditional entry studies mirror the method for a single-person qualitative choice model. They view observed entry decisions as a reflection of an underlying regression. Then a standard latent regression model can be set up as

$$(4.1)\quad \Pi^{*}_{ijt} = \pi_{ijt}(\square) + v_{ijt}$$

where $\pi(\cdot)$ stands for a systematic part of profits, which normally includes market characteristics and market structural variables, and v_{ijt} is an error term to capture unobserved profit components. As with an individual choice model, researchers do not have direct measures of profits, and can only observe whether firms enter a market or not. The observation rule is given as

$$(4.2)\quad \begin{aligned} E_{ijt} &= 1 \quad if\ \Pi^{*}_{ijt} \geq 0 \\ E_{ijt} &= 0 \quad if\ \Pi^{*}_{ijt} < 0 \end{aligned}$$

That is, a potential entrant enters a market if he can earn a non-negative profit, and does not enter if he only earns a negative profit. The error term is normally assumed to follow a normal or logistic distribution, which results in a simple probit or logit model.

The interpretation focuses on the coefficient on market structure variables, such as concentration ratio or the number of firms in a market. A negative coefficient implies that profits are negatively related to market structure, consistent with the traditional wisdom of industrial organization. This is where a traditional entry model departs from a single-person qualitative choice model. In the case of an individual choice model, it is reasonable to assume that an individual's payoff does not depend on others' choices. In contrast, when we examine firms' entry decisions in industries where there are only a small number of firms, firms' profits greatly depend on rivals' actions. In an attempt to take account of this strategic nature, a traditional entry model includes market structure variables as independent variables. Limitations arise from the inadequate treatment of the interrelated nature of firms' entry decisions. When making entry decisions, firms take account of the optimal entry decisions of other firms as well as other numerous market conditions. Thus market structure is in nature endogenous in the system. Traditional entry models failed to deal with the endogeneity of market structure variable, simply treating them as exogenous. A more fundamental shortcoming is the lack of equilibrium concept identified by Bresnahan and Reiss (1990), which I will explain in the next part. Despite the theoretical weakness, however, the simple discrete choice model can still provide a rough picture of the competitive nature in question. It is a common practice to estimate

simple discrete choice models as a baseline or a point of comparison and, in many cases, the estimation produces very similar results to more general models. In this study, I start with simple probit models as well.

4.2.2. An empirical entry model in oligopoly markets

In oligopoly industries, as mentioned earlier, firms make interrelated entry decisions since their profits greatly depend on rivals' actions. To take account of this strategic situation in firms' entry decisions, Bresnahan and Reiss (1990 and 1991) and Berry (1992) explicitly introduce a game theoretic framework in their seminal paper.

This study follows the framework of a standard two-stage entry game. In the first stage, each potential entrant is assumed to make decisions to enter a market or not. Then, in the second stage, they compete with each other in prices or quantities, which determines post-entry profits. As we could not observe firms' post-entry profits, the profits are treated as unobserved random variables. The post-entry profit is assumed to be of form

$$(4.3)\quad \Pi^*_{ijt} = X'_{ijt}\beta + h_{ijt}(\square) + v_{ijt}$$

where a vector X stands for a vector of market characteristics affecting market demand and cost conditions, h(·) denotes a function of market structural variables and v_{ijt} is an error term to capture unobserved profit components. Π* is a latent variable, and by assumption, we only observe the outcomes of decisions made by firms, whether to enter a market or not. Hence, the observation rule is given as

$$(4.4)\quad \begin{aligned} E_{ijt} &= 1 \ \ if\ \Pi^{*}_{kijt} \geq 0 \\ E_{ijt} &= 0 \ \ if\ \Pi^{*}_{ijt} < 0 \end{aligned}$$

That is, entry decisions are made if potential entrants expect positive post-entry profits, and no-entry decisions if negative profits. It should be noted that this study assumes potential entrants play a one-shot entry game. That is, I assume a static model, not considering the possibility that this period's decisions may affect future ones. And I assume that potential entrants play a game every year in a given market.

The game theoretic structure requires the existence of a unique equilibrium to model firms' entry decisions for the estimation. Bresnahan and Reiss (1990) show that a simultaneous move game even with two potential entrants can fail to produce a unique equilibrium, where either of two potential entrants can make a positive profit and hence either of them can enter the market to establish a monopoly market. This implies the existence of multiple equilibria in this game, which makes it impossible to use a standard discrete choice model for the analysis of entry decisions. Without the explicit consideration of the game theoretic framework, traditional entry models failed to recognize this aspect. Bresnahan and Reiss (1990) suggest several solutions to this. First, the introduction of other equilibrium selection rules can eliminate a non-unique equilibrium situation. For example, a simple assumption that firms never have profits in that region can exclude the presence of multiple equilibria. However, this is obviously ad hoc. Another alternative is to model entry decisions with regard to the equilibrium number of entering firms, which is unique. In this method, the number of equilibrium entrants becomes a dependent variable and a market rather

than a firm will be the unit of observation. This is a very popular approach which many succeeding studies take. As Berry (1992) shows, however, more than two potential entrants pose a serious computational problem.[1] In addition, the unit of observation is a market in a given year, which makes it impossible to use the identification of potential entrant. As a result, we cannot analyse the competitive behavior between domestic and foreign firms, which is the main object of the study.

This study resorts to the last alternative, introducing the assumption of a sequential move game. In the above example, the multiple equilibria arise because two potential entrants make entry decisions simultaneously. If they make entry decisions sequentially, the indeterminate region disappears with a unique equilibrium ensured all the time. The intuition is that once there is an order in entry decisions, the first mover can make an entry decision to claim a monopoly market, eliminating situations where the identity of entrant is not determined. Especially where there are a number of potential entrants, the introduction of an order of entry decisions is a popular solution. Many researchers, including Bresnahan and Reiss (1990), Berry (1992) and Waterson and Toivanen (2001), introduce the assumption of a sequential move solution concept to secure the presence of a unique equilibrium.

Regarding the order of entry decisions, I assume that larger chains (in terms of outlet numbers) move first and smaller chains follow next. In the context of the superstore industry, this means that two domestic chains move first with three

[1] If we accept a restrictive error structure, like perfect correlation between unobservables, we can build up a simple ordered probit or logit as a special case.

foreign chains following next.[2] The justification for this crucially depends on how reasonable the assumption is in the context of the industry in question. First, the assumption is motivated by the reasoning that, other things being equal, early movers' advantages might have helped larger chains to create larger networks than their rivals. They might exploit early movers' advantages to claim lucrative monopoly or duopoly markets. In addition, the fact that two domestic chains have been retail giants for a long time in the retail industry helps to justify the above assumption. They have been the first and third largest company in the department store sector, which had been the largest retail sector before grocery superstore sector outpaced it in 2000. Therefore, they might possess the knowledge and experience to move ahead of foreign competitors in entry decisions.[3] The fact that most monopoly markets are claimed by these domestic chains supports this assumption. Out of 37 monopoly markets in 2004, 32 markets are claimed by two domestic chains, in which Emart accounts for 20 markets while Lottemart 12 markets. To check how robust the results are to the assumption, I re-estimate the model using different orders of entries. An alternative order of entry decisions could be that chains with larger market share move first and small chains follow next.[4]

Turning to the profit function, the specification of estimation model depends on the structure of two parts of the profit function: a systematic part of profits and an

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[2] As seen in Table 4.1, this assumption results in the order of Emart-Lottemart-Tesco-Carrefour-Walmart.

[3] Many trading sources attribute the success of the market leader, Emart, to the acquirement of a large number of potential sites ahead of rival chains.

[4] Another alternative is to assume that early entrants into the industry move first while late entrants follow them. This order of entry coincides with the main assumption, considering that domestic chains are long-serving retail giants in Korea.

unobservable component of profits which is captured by a random term. Following Berry (1992), the former is assumed to be a variable portion of profits and the latter a fixed cost part. The systematic part of profits in (4.3) is defined as

$$(4.5)\quad \begin{aligned} V_{ijt} &= X_{ijt}'\beta + h_{ijt}(\square) \\ &= \beta_1 + \beta_2 Pop_{ijt} + \beta_3 Apart_{ijt} + \beta_4 Bigcity_{ijt} + h_{ijt}(\square) + Dum'\gamma \end{aligned}$$

where Pop stands for the size of population, Apart denotes the proportion of residents living in apartment blocks, Bigcity is a dummy variable to have a value of 1 if a local market is a part of a large city or 0 otherwise, h(·) is a function of market structural variables, and lastly Dum stands for a set of chain or period dummy variables. As said earlier, the systematic part of profits is viewed as representing variable profits, which is affected by several factors of market demand and the competitive conditions. First, the size of population basically determines the total demand for grocery superstore shopping in a given market. Since the larger its population is, the more superstores a local market can accommodate, a positive relationship between population and profits is expected. Given the size of population, the type of residence is an important factor in determining the size of demand. The inclusion of Apart as an independent variable is motivated by the fact that residents in apartment blocks are important customers in grocery superstore shopping. In Korea, apartments are the most popular type of housing, normally constituting a wealthy area where the demand for grocery superstores is strong. A number of trade sources indicate that superstore chains regard residents in apartment blocks as key customers, and hence, in deciding the site of a new store, consider the existence of

large apartment blocks in the catchment area as a key factor.[5] Therefore, we can expect a positive relationship between profits and the proportion of people living in apartment blocks. It may be the case that superstore chains focus their activities on metropolitan areas such as Seoul, where the demand for grocery superstores may be stronger. I also include a set of period dummy variables to control for the differences in profits arising from different periods. Superstore chains may have different cost structures. To control for this, I introduce a set of chain dummy variables as long as the specification is allowed. In a kind of robust test, I include several other variables which might affect variable profits, such as the price of land and population density, as independent variables. Finding that they are insignificant and do not affect the results, I drop them in the main estimation.

Of main interest is the market structure function, which may contain variables to represent market competitive circumstances. The conventional wisdom of industrial organization has it that market structure, like the presence of competitors, greatly affects firms' profits. Therefore, the number of competitors in a given market is an obvious candidate for a market structure variable. To see how chains react to foreign and domestic rivals, I split the number of competitors into domestic and foreign ones. To take account of the fact that superstores chains have a tendency not to open an additional store where they already have a presence, I include the number of its own stores as a control variable. Since the specification

[5] Personal interviews with several directors of leading chains also confirm this fact.

varies across the models, I will leave the exact specification of market structure variables to the section below on estimation results.

Regarding market structural variables, an important issue to note is an endogeneity problem. In a sequential move game, early movers take account of followers' decisions in making their entry decisions, while followers can make their decisions taking the leaders' decisions as given. Therefore in the estimation of the leaders' decisions, a typical endogeneity problem arises. A simple solution is to assume that leaders are short-sighted in conjecturing rivals' optimal reactions. That is, when they make entry decisions, they assume the number of rivals' stores will remain the same. This is very ad hoc. This study employs the method proposed by Toivanen and Waterson (2000 and 2001) to simulate followers' optimal responses to leaders' decisions. The intuition behind the methodology is that leaders take account of their conjectures on followers' moves in making their decisions.

The procedure is as follows. For simplicity, consider the case of three potential entrants, firm A, B and C, where A is the first mover, B the second mover, and C the last mover. The first step is to estimate the last mover's entry decisions, where the last mover views the two early movers' entry decisions as given. That is, if both A and B have entered the market, the last mover has to face two additional competitors than in the previous period. If either A or B has entered the market, C faces one more rivals' store than in the previous period. Therefore, we can estimate the last mover's entry decisions based on the traditional probit model, without worrying about any endogeneity problem. This step produces the coefficients for the last mover.

The next step is to estimate the second mover's entry decisions. While B views the first mover's entry decisions as given, it has to make conjectures on the last mover's entry decisions when making its entry decisions. In creating B's conjectures on the last one's decisions, I follow the method proposed by Toivanen and Waterson (20001 and 2001). First, I exploit the last one's estimated coefficients to create a systematic part of profits. Then, for an unsystematic part of profits, I draw R pseudo random numbers from a standard normal distribution. Now, we can create simulated entry decisions of the last mover conjectured by the second mover based on

$$(4.6)\quad \begin{array}{l} 1(\hat{\pi}_{ijt} + \hat{\varepsilon}_{ijt} \geq 0) = 1 \ \ if \ \ true \\ 1(\hat{\pi}_{ijt} + \hat{\varepsilon}_{ijt} \geq 0) = 0 \ \ if \ \ otherwise \end{array}$$

where 1( ) is an indicator function having a value of 1 if it is true and 0 otherwise. Then we could add the sum of this conjecture and the first mover's decisions to the existing number of rivals' stores. Now we fit this number into the second mover's log likelihood function instead of the number of rivals' stores in the previous period. The second step produces the coefficients for the second mover.

The final step is the estimation of the first mover's entry decisions. In comparison with the second or the last mover, the first mover has to make conjectures on the two followers' moves. The procedure to create simulated entry decisions is the same as the one in the second mover's estimation. For the last mover's entry decisions, I utilize the last mover's estimated coefficients obtained in the first step, with drawing R pseudo random numbers from a standard normal distribution. This produces conjectures on the last mover's decisions. Then, I move

on to simulated entry decisions of the second mover conjectured by the first mover. First I use the second one's estimated coefficients to create a systematic part of the second mover's profits. Second I draw R pseudo random numbers from a standard normal distribution. This procedure creates simulated entry decisions of the second mover conjectured by the first mover. It is the last step that we add these conjectures on the second and last mover's decisions to the existing number of rivals' stores and fit this number into the first mover's log likelihood function instead of the number of followers' stores in the previous period. Where there are more than three potential entrants, this procedure can be expanded likewise.

4.3. Entry in the grocery superstore industry and the data

4.3.1. Entry in the grocery superstore industry

To analyse the entry patterns of domestic and foreign firms, the study exploits the rapid expansion of chain networks in the Korean grocery superstore industry.[6] Several features make the grocery superstore industry a favourable candidate for the empirical investigation in question. First, the grocery superstore sector is a very fast-growing industry, which enables us to observe a number of entries on a firm basis over a short period of time. Table 4.1 depicts the fast growth

[6] As in the previous chapter, a grocery superstore in this study is defined as a retail store with floor space of more than 3,000 square meters, selling grocery items. Although there are several other types of grocery stores, as explained earlier, this study focuses on the grocery superstore industry. Excluding other types of grocery stores can be justified by the fact that other types of grocery stores cannot provide the same kind of one-stop grocery shopping service that grocery superstores provide.

in terms of store numbers since 1996, along with details on five leading chains. Since the first store was opened in 1993, grocery superstores are, at a rapid pace, replacing old types of grocery shopping like traditional grocery markets: the total number of outlets soared from 1 in 1993 to 270 in 2004. The year of 1996 marked a turning point in the development of the grocery superstore industry. As the liberalization programme relating to the retail industry had been established, the prohibition of foreign firms opening (any kinds of) superstores was abolished.[7] Since then, several foreign retail giants, such as Carrefour (1996), Tesco (1997) and Walmart (1998)[8], have entered the grocery superstore sector and quickly joined the leading group of chains through aggressive expansion of their networks. The fact that the grocery superstore sector was a new industry left them not many options but to build their chain networks organically. This provides a chance to see how domestic and foreign chains compete with each other in the entry stage. The study looks at the period of 1997 to 2004, when we could see entries by both domestic and foreign firms.

[Insert Table 4.1 here]

Another feature to note is that the industry is a typical oligopoly at the national level as well as at the local level. Since 1997, the current top five chains

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[7] Until 1997, foreign firms were allowed to open only less than 20 stores with floor space of less than 3,000 square meters, which virtually prohibited foreign firms from entering the grocery superstore industry.

[8] Although Walmart entered the market through acquiring Macro Korea, another foreign chain, most of their expansion has been made through organic growth. Macro Korea opened 4 stores in 1996-1997 before the acquisition. In the main estimation, I treat those 4 stores as entries made by Walmart. Dropping the first two years or Walmart from the sample does not change the main findings.

have quickly emerged as market leaders, collectively accounting for 80 per cent of the market in sales in 2002, even though, except for Emart which is the first grocery superstore chain in Korea, they were relatively late entrants. The leading group consists of two domestic retail giants, Emart and Lottemart, and three global retail giants, Tesco, Carrefour and Walmart. Their dominance has become more and more apparent. During the period of 2000 to 2004, the five leading chains accounted for 106 new outlets out of 136 new entries. In the last two years, the top five chains accounted for all the new outlets, while other small chains opened none. Although there are about 20 chains altogether, I therefore focus on the entry behaviour by the leading chains who are thought to be the strategic players. Another point is that the leading chains started their business practically at the same time. As seen in Table 4.1, three of the leading chains opened their first store in 1996 or 1997. Even Emart, the first superstore operator, had only six stores. Therefore, there is little possibility that being early entrants or late entrants makes a systematic difference in their entry behaviour.

The availability of firm-level data is another key advantage. This enables us to look at entry decisions on a firm level, while many other studies base their estimation on a market-level or on the pooled data of many firms. Therefore, in building models, this study can allow for heterogeneity in entry behaviour between firms.

Grocery shopping is in nature local, given the fact that consumers do not travel too far to do it. As a result, it is logical to define local markets as a geographical market. The study identifies 160 local markets across Korea, based on

the administrative areas, which could be small cities or administrative districts in metropolitan cities. Note that in defining local markets, I exclude whole rural areas since the demand is not sufficient to support a grocery superstore. The exclusion can be justified by the fact that no superstore chains have ever opened an outlet targeting these rural areas.[9] The delineation of local markets according to administrative areas is, to a large extent, ad hoc. Although each small city constitutes a rather isolated market, as in Bresnahan and Reiss (1990) and Manuszak (2002) where they selected a sample of isolated towns to avoid the problem of geographical market definition, the boundary of local markets in metropolitan cities is not clear-cut similar to Toivanen and Waterson (2001). To see whether the geographical definition might affect the result, I estimate the model for a sub-sample of data set including only small cities.

4.3.2. The data

The study requires data for market and store characteristics. The information on stores is collected from the Korean Chainstore Association (TKCA), which publishes the list of superstores containing opening dates, store locations and floor space by chain every month. Since the list is exhaustive, we could safely construct variables on market competition as well as an entry variable. The independent variables on market characteristics include population and housing types, which are

[9] There is a store located in a rural area, but it is targeting a neighbouring city.

collected from the database of the Korean Statistical Office. The data on population come from the Census of Population and the Resident Registration Population, while the data on housing types is obtained from the Census of Housing. The Censuses on Population and Housing take place every 5 years. To obtain annual data for population, therefore, I supplement the Census of Population using the Resident Registration Population produced every year. On the other hand, in the case of housing type, I use the 2000 Census of Housing for the whole sample period because there is no alternative for annual housing data. This assumes that there is no significant change in housing type during the period. Given the fact that a large scale of housing construction has not been common, the assumption is not particularly unrealistic.

As said earlier, the sample period is from 1997 to 2004. This implies that we can observe eight annual observations, since each chain is assumed to make entry decisions each year in a given market.[10] To construct the dependent variable, I observe whether a chain enters a given market or not each year. For the construction of market structure variables, such as the number of rivals' stores operating in a market, or the number of its own stores operating already, basically I count the number of stores in question at the beginning of each year. In a sequential move game, reflecting the nature of sequential entry, I count the number of stores at the

[10] One might raise a question about the annual observation unit. In other words, one can object to the assumption that the length of the entry stage is a calendar year. Similar arguments to Toivanen and Waterson (2001) can be made: leading chains publish annual reports, and they announce annual plans of new outlet openings.

end of each year, although leaders' conjectures on followers' optimal responses are obtained through a simulation technique.

Table 4.2 summarizes the descriptive statistics of the sample. As the statistics show, the local markets are different in terms of the size of population and housing type. The size of population ranges from 53,000 to 677,000. Apart is the ratio of households living in apartment blocks to total households. The summaries of Apart indicate that the relative importance of people living in apartment blocks differs significantly across local markets. The number of own stores already operating in a market does not exceed 2, suggesting that chains are less likely to open multiple stores in a given market. The number of existing stores varies considerably as well. While 7 stores compete with each other in a market, less than one store is, on average, operating. Although, excluding 33 local markets which have never received any new entries, the average rises to 2, the number is still not large.

[Insert Table 4.2 here]

4.3.3. Some descriptive results

Before considering the estimation results, I briefly look at some descriptive statistics concerning entry behaviour. First, to examine the importance of market structure in entry decisions, I cross-tabulate the frequency of entries by number of all existing stores in the market. Table 4.3 presents the results. As expected, the entry frequency decreases as the number of existing stores increases, suggesting that

entries are negatively related to market concentration. And it is found that no entry takes place in a market with more than 4 existing stores. The difference in entry pattern between domestic and foreign chains deserves more attention. Leading domestic chains appear to enter markets where competitive pressure from competitors is not intensive. Of 101 entries made by two domestic chains, nearly half of them occur in new markets and nearly 80 per cent of entries occur where there are less than two existing competitors. That is, they appear to prefer monopoly or duopoly to oligopoly. In addition, new entries sharply decrease as the number of existing stores rises, suggesting a negative relationship between entries and the number of existing stores. On the other hand, foreign counterparts reveal a different pattern. They are less likely to enter new markets and instead more likely to enter markets with one or two existing competitors compared to their domestic counterparts. The negative relationship between entries and the number of incumbent stores is not as apparent as in the case of domestic chains.

[Insert Table 4.3 here]

One might raise doubts about the argument that these findings suggest different entry strategies between the two, saying that the different pattern above might just reflect “a snap-shot of long-term process” in the development of the grocery superstore industry. There is possibility that, as late entrants into the industry, foreign firms might have no choice but to open a store where domestic chains already have a presence. If this is the case, the entry pattern should be like the above

without different entry strategies between them. However, as said earlier, nearly all the leading chains have started to build up their networks since 1996, so that there is no such time gap to produce the late entrant effect. Furthermore, the second domestic chain, Lottemart, which is the last entrant among the leading chains, reveals a very different entry pattern from foreign chains.

Although Table 4.3 examines the likely effect of overall market structure on entry decisions made by leading chains, there is a possibility that leading chains may be more concerned with the presence of other leading chains which are strategic players covering markets nationally. In addition, since foreign entry was permitted in 1996, there has been a widespread fear that foreign chains possessing high managerial know-how and global sourcing power as global retail giants may out-compete domestic chains and dominate the market. Hence, local chains might sensitively react to the presence of foreign chains. Table 4.4 presents simple statistics relating to the entry frequency by number of other leading stores. It appears that both domestic chains prefer to enter a market where no leading chains have a presence. Of 101 new entries during the sample period, more than 70 per cent of entries took place where competitive pressure from rival chains was absent. Especially in the case of Lottemart, the second domestic chain, three-quarters of entries occurred where there were no other leading chains. Although foreign chains also appear to be more responsive to the presence of other leading stores than to the total number of existing stores, they still are less sensitive than domestic chains are. The frequency of new entries made by domestic chains sharply decrease as the number of other leading chains rises, while the decrease of new entries by foreign chains is rather flat. The

statistics might suggest the existence of asymmetry between domestic and foreign chains in the responses to rivals' presence.

[Insert Table 4.4 here]

Another pattern of entry behaviour needs to be mentioned. Superstore chains display a strong tendency not to enter markets where they already have a presence. Table 4.5 depicts the pattern. Of 170 entries, only 11 entries occur where they already have a presence. Another observation to note is that there is no case in which each superstore chain made multiple entries in a given market/year combination. The implication is that grocery superstore chains take their own presence as an important factor in deciding whether to enter a market, which is an underlying reason to include a variable for such a store's own presence as an independent variable.

[Insert Table 4.5 here]

4.4. The estimation results

4.4.1. Simple probit models

The main aim of the study is to investigate the nature of competition between domestic and foreign chains. As a baseline model, I employ a simple probit model. Although the simple probit model has limitations, as explained earlier, the

model is still useful to view a broad picture. Many previous studies estimate a simple probit model as a baseline model or as a point of comparison, obtaining the similar qualitative results that more general models produce.

Table 4.6 examines the effect of overall market structure on entry decisions. Two profit functions are defined as

$$\Pi_{ijt} = \beta_1 + \beta_2 Pop_{ijt} + \beta_3 Apart_{ijt} + \beta_4 Bigcity_{ijt} + \beta_5 Own_{ijt} + \beta_6 All_{ijt} + Dum'\gamma + \varepsilon_{ijt} \quad (4.7)$$

$$\Pi_{ijt} = \beta_1 + \beta_2 Pop_{ijt} + \beta_3 Apart_{ijt} + \beta_4 Bigcity_{ijt} + \beta_5 Own_{ijt} + \beta_6 Leading_{ijt} + Dum'\gamma + \varepsilon_{ijt} \quad (4.8)$$

where both All and Leading are market structural variables, the former counting the number of all the existing stores in the market and the latter measuring the number of leading chains' stores in the market respectively, and where Own is a control variable for its own presence. The first equation is for the odd number columns, while the second equation for the even number columns. The dependent variable is a binary choice of entry or no entry. Throughout the columns, I include two sets of dummy variables to control for differences arising from different periods and different chains: period dummies and chain dummies, which I do not report here. Employing the full sample of data, the first and second column examines the entry decisions of leading chains, implicitly assuming that leading chains are the same (or very similar) in their entry behaviour. Population and Apart produce a significant and positive estimate respectively, suggesting that the larger the population is, and the more people live in apartment blocks, the more likely it is that superstore chains enter the market: in other words, the more profits they can earn. These results are consistent with expectations. It seems that entering a market in a large city is not a

significant factor in entry decisions. As expected from the simple descriptive statistics, Own has a significant and negative coefficient. In columns 1 and 2, as seen in the simple descriptive statistics, All and Leading have a significant and negative coefficient, suggesting that firms are not inclined to enter a market where competitors have a presence. This result is consistent with the traditional wisdom of industrial organization that firms' profits decrease as the number of competing firms increases.

Although the results in the whole sample are consistent with the wisdom of industrial organization, closer examination of the foreign and domestic group produces a different story. While columns 3 and 4 examine entry decisions by domestic firms, columns 5 and 6 deal with those by foreign firms. Regarding Pop, Apart and Own, the estimation produces similar results to the whole sample, with no qualitative difference between the two groups observed. An interesting result is the large difference between domestic and foreign chains in the response to the rivals' presence or to market structure. In the case of domestic chains, as seen in columns 3 and 4, Leading and All have a significant and negative estimate, indicating that domestic chains expect diminishing profits as competitors in a market are increasing. Therefore domestic chains are cautious in entering markets where rivals' stores already exist. In contrast, as seen in columns 5 and 6, the coefficients on Leading and All are not significant, even though their signs are negative as expected, indicating that foreign chains pay less attention to the presence of competitors than domestic counterparts when they make entry decisions. In other words, they do not expect that their profits will decrease significantly as the number of competitors increases. The

parameter on Bigcity is insignificant in both groups, although the estimated parameters have opposite signs.

[Insert Table 4.6. here]

Table 4.7 examines how firms respond to foreign and domestic competitors. To do this, I split the number of leading chains' stores into two variables: the number of foreign rivals' stores and domestic rivals' stores. Hence, the profit function (of the second column in each group) is slightly modified as

$$(4.9)\ \Pi_{ijt} = \beta_1 + \beta_2 Pop_{ijt} + \beta_3 Apart_{ijt} + \beta_4 Bigcity_{ijt} + \beta_5 Own_{ijt} + \beta_6 Diff_{ijt} + \beta_7 Same_{ijt} + Dum'\gamma + \varepsilon_{ijt}$$

where Diff and Same stand for the number of other group's stores and own group's stores. That is, in the case of domestic chains, Diff measures the presence of foreign competitors and Same counts the number of domestic rivals' stores, while in the case of foreign chains, Diff measures the presence of domestic counterparts and Same indicates the competitive pressure from other foreign chains. Again the dependent variable is a binary choice of entry or no entry.

Concerning Pop, Apart and Own, the results are again very similar between the two groups of chains. However, there is sharp asymmetry between them in the response to foreign or domestic rivals. Domestic firms expect decreasing profits with the growing presence of foreign rivals, so that they refrain from entering markets where foreign rivals have a presence. On the other hand, foreign chains seem to expect that the presence of domestic or foreign rivals does not pose a significant threat to their profits, given insignificant coefficients on Diff in columns 3 and 4.

Another interesting result is a large difference in values of coefficients on Diff and Same in column 2.[11] This might indicate that domestic firms consider competitive pressure from domestic rivals more seriously than that from foreign rivals.

[Insert Table 4.7 here]

The above estimation is based on pooled data, implicitly assuming that chains within a group make the same (or very similar) types of entry decisions in response to market conditions. Although this is a common practice, it is an arbitrary assumption to a large extent. It is more reasonable to assume that each superstore chain may have its own entry strategy or pattern. However, in many empirical settings,[12] estimation by chains is not possible simply due to data availability. In this regard, the current data set has a big advantage in assessing entry decisions by each chain. Tables 4.8 and 4.9 analyse and compare entry decisions by chain. While Table 4.8 focuses on the response to the overall presence of rivals, Table 4.9 looks at how each chain responds to the presence of a certain group of rivals, that is, foreign competitors and domestic competitors. The profit functions are defined as being the same as (4.7) and (4.8).[13] The interpretation focuses on the estimated parameters on market structural variables, such as Leading, Same and Diff. First, let us consider the

[11] The test rejects the hypothesis of two coefficients having the same values.
[12] Cotterill and Haller (1992) is a typical case, where they pool entry decisions by 20 supermarket chains. Except for the market leader, the meaningful estimation for each chain seems impossible due to the small number of entry occurrences.
[13] In the case of Walmart, I drop a variable of Own since no entry occurs where there is already its own store. For Carrefour in Table 4.9, I drop a variable of Same for a similar reason to the case of Walmart. Since there is no entry where foreign rivals have a presence, Same has no explanatory power statistically.

results in Table 4.8. There is still a large difference between foreign and domestic chains in the reaction to overall market structure. While, in columns 1 and 2, negative and significant estimates on Leading suggest that domestic chains expect decreasing profits with the growing presence of rivals, all estimates on Leading across foreign chains are insignificant, indicating that they do not fear their profits to be affected by rivals' presences. The overall results are consistent with Table 4.6.

Table 4.9 provides a different story from the estimation of grouping data shown in Table 4.7. The sharp asymmetry between domestic and foreign chains found in the estimation of grouping data disappears. Emart reacts sensitively to the presence of its domestic rival (that is, Lottemart), but not to foreign chains. On the contrary, Lottemart seems to avoid foreign rivals rather than its domestic rival (in this case, Emart). Remember that, as shown in Table 4.7, domestic chains seemed to avoid both domestic and foreign chains' presence. This might indicate that pooling data is not appropriate for this industry. Of interest is the result relating to Tesco: the coefficient on Diff is now significant, suggesting that Tesco seems to avoid entering markets with domestic rivals. Given the fact that Tesco belongs to the top three chains, along with Emart and Lottemart, these results may imply that the rivalry between the top three chains is more important than that between foreign and domestic chains. [14]

[Insert Table 4.8 here]

[14] Tesco is the third largest chain in outlet numbers but the second largest chain in sales.

[Insert Table 4.9 here]

4.4.2. Multivariate probit models[15]

A natural extension of the simple probit models in Table 4.8 and 4.9 would allow for a system of equations with correlated unobserved profit components among the five chains. The intuition is that each chain has its own unobserved profit components, reflecting possible differences in the structure of fixed costs, but that these unobserved profit components may be correlated in a given market. This is in line with the basic idea of a seemingly unrelated regression model, except that the dependent variables are binary choice variables. This leads to a standard multivariate probit model. In this case, the system of five profit functions can be formulated as

$$\Pi_{ijt} = \beta_{i1} + \beta_{i2} Pop_{ijt} + \beta_{i3} Apart_{ijt} + \beta_{i4} Bigcity_{ijt} + \beta_{i5} Own_{ijt} + \beta_{i6} Leading_{ijt} + Dum'\gamma + \varepsilon_{ijt}, \quad where\ i = 1,2,3,4,5 \tag{4.10}$$

$$\Pi_{ijt} = \beta_{i1} + \beta_{i2} Pop_{ijt} + \beta_{i3} Apart_{ijt} + \beta_{i4} Bigcity_{ijt} + \beta_{i5} Own_{ijt} + \beta_{i6} Diff_{ijt} + \beta_{i7} Same_{ijt} + Dum'\gamma + \varepsilon_{ijt}, \quad where\ i = 1,2,3,4,5 \tag{4.11}$$

The former is for Table 4.10, the latter for Table 4.11. Tables 4.10 and 4.11 present the results, which are not different from the simple probit models in Tables 4.8 and 4.9. A large difference between foreign and domestic chains still appears concerning their reaction to the overall presence of rivals, as seen in Table 4.10. For domestic chains, the estimated coefficients on Leading are negative and significant,

[15] Following Cappellari and Jenkins(2003), this study employs a simulation method to estimate the multivariate probit regression model.

while the estimates are not significant for foreign stores. Table 4.11 displays the same pattern as Table 9. Regarding the reactions to foreign or domestic rivals, asymmetry between domestic and foreign chains declines significantly. Instead, the result again suggests that the rivalry between the top three chains is more important. It should be noted that this model assumes short-sighted firms which anticipate the number of rivals' stores to remain unchanged even at the end of the period. In the sense that this formulation does not take account of rivals' strategic responses, this model is based on a reduced form of profit function.

[Insert Table 4.10. here]

[Insert Table 4.11. here]

4.4.3. Sequential entry game: simulated maximum likelihood estimation models

In an attempt to overcome the unrealistic assumption of short-sighted entrants, Tables 4.12 and 4.13 explicitly introduce the concept of a sequential move entry game, assuming that there is an order of entry decisions: larger chains (in terms of outlet numbers) move first and smaller chains follow next. That is, in Table 4.12 and 4.13, entry decisions are, by assumption, made in the order of Emart-Lottemart-Tesco-Carrefour-Walmart, where the first two chains are domestic and the rest foreign. Thus followers view leaders' decisions as given. In contrast, leaders take into account the optimal responses of followers when making their decisions, which

leads to a typical endogeneity problem. To deal with this, as mentioned earlier, the study employs a simulated maximum likelihood estimation method. The profit function is defined similar to (4.7) and (4.8). The only difference is the way of counting market structural variables and of forming log-likelihood functions in the leaders' estimation.

In the case of Table 4.12, the overall picture does not depart from its counterparts of simple or multivariate probit models. Regarding the responses to the presence of other leading chains, asymmetry between domestic and foreign chains is again apparent. Domestic chains expect decreasing profits with the growing presence of competitors, while foreign chains pay little attention to the overall presence of rivals. Table 4.13 examines the responses to the presence of foreign or domestic rivals, as in Tables 4.9 and 4.11. There are some changes compared to the counterparts of the simple and multivariate models. In the case of Lottemart, the coefficient on Same becomes significant, and the estimate on Diff in Tesco becomes more significant. That is, Lottemart fears domestic rivals' presence as well as that of foreign competitors, while Tesco considers the presence of domestic rivals as being more serious than that of other foreign rivals. And all the significant estimates on Same and Diff have larger values. Altogether, these allow us to argue that the rivalry of the top three chains is a more likely situation. To check this possibility of the rivalry explicitly, I split the number of leading stores into two other variables: the presence of three large chains' stores and the presence of others. Table 4.14 presents the results. As expected from Table 4.13, a strong asymmetry between the three large chains and others appears. The three large chains take into account each other's

presence more seriously, while others pay little attention to the presence of them. The results suggest the intense competition between the three large chains, which forces them to avoid other large chains. In summary, it seems that the distinction between large chains and others is more important than the identification of foreign and domestic chains.

To check whether the assumption on the order of entry decisions affects the estimation results, I try an alternative assumption relating to the order of entry decisions: a chain with a larger market share moves first before chains with smaller market share make decisions. This assumption is motivated by the reasoning that, with other things being equal, early movers' advantages might have helped them account for a larger market share. The results are not different from the baseline order of entries.

[Insert Table 4.12. here]

[Insert Table 4.13. here]

[Insert Table 4.14. here]

4.5. Conclusion

This chapter infers the nature of competition between foreign and domestic firms from entry decisions. The Korean grocery superstore industry serves as an ideal testing ground for the exploration of this phenomenon. The rapid expansion of the industry along with a large scale of foreign entries enables us to compare entry

decisions made by foreign and local firms. If foreign firms, as in many cases, are allowed to enter markets only after domestic competitors establish their networks, there is strong possibility to observe different entry patterns between foreign and domestic firms just because foreign firms are late entrants into the industry. Given that they started their business at the same time as their domestic counterparts, however, we can safely treat the difference between the two, if found, as a genuine one in terms of entry strategies. In addition, in contrast to many studies, the availability of comprehensive firm-level entry data allows us to exploit the information on *de novo* entry, and to allow for different entry behaviour between firms. Concerning modelling issues, I introduce a sequential move game concept to secure a unique equilibrium. In dealing with the endogeneity problem in the leaders' estimation, I extend a simulation technique proposed by Toivanen and Waterson (2001) to an oligopoly industry.

The estimation based on pooled data produces the results that the presence of competitors deters entries, supporting the old wisdom that firms' profits decrease with the increasing number of competitors. However, closer examination of each chain provides a rather different story. Regarding the responses to overall market structure, there is a significant difference between domestic and foreign firms. While domestic chains avoid entering markets with the growing presence of competitors, how many competitors they will encounter after entry does not deter foreign firms from entering the market. That is, overall market structure matters for domestic firms but not for foreign firms. Along with the little evidence on the rivalry between local and foreign chains, this finding may imply that foreign firms have more optimistic

views of post-entry profits or they prefer established markets to new ones. Another interesting result is asymmetry between the top three chains and others. The three large chains avoid each other's presence, while small chains do not care about the top three chains' presence, indicating the intense rivalry between the three large chains. These findings again support the alternative view on a foreign firms' role in competition: foreign firms also are expected to act as a member of an oligopoly group rather than as a kind of maverick. Another point to note is that, given that there are significant differences in firms' responses to rivals' presences, the study indicates that it may be problematic to assume identical (or very similar) entry behaviour between firms as many studies do.

Extension of this paper would deepen our knowledge about firms' entry decisions as well as the competitive interactions between foreign and domestic firms. This thesis has assumed that superstore chains make independent decisions on every market-period combination, without considering entry decisions on other markets or future decisions. Modelling of multi-store operations in chain-store industries or the explicit consideration of the dynamic nature of firms' entry decisions could provide more insight into the underlying causes of market structure or the nature of market competition.

Appendix

Table 4.1 Trend in the number of outlets

	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total	27	47	68	94	135	176	222	253	271
Top five	11	18	28	45	75	108	141	163	181
Emart	6	9	13	19	27	41	50	59	69
Lottemart	0	1	4	8	16	23	31	34	38
Tesco	0	1	1	2	7	14	21	28	31
Carrefour	3	3	6	11	19	21	24	27	27
Walmart	2	4	4	5	6	9	15	15	16
Others	16	29	40	49	60	68	81	90	90

Table 4.2 Descriptive statistics of sample

	Mean	Std. Dev	Min	Max
Population (100,000)	2.68	1.34	0.53	6.77
Apartratio	0.481	0.184	0	0.897
Ownstore	0.09	0.299	0	2
Number of existing stores	0.7943	1.135	0	7
Number of leading chains	0.3618	0.6846	0	4

Table 4.3 The entry frequency by number of existing stores

# Entry	0	1	2	3	4	Total
Whole sample	72	51	30	10	7	170
Domestic chains	52	28	12	4	5	101
Emart	29	20	7	4	3	63
Lottemart	23	8	5	0	2	38
Foreign chains	20	23	18	6	2	69
Tesco	6	9	12	2	2	31
Carrefour	9	11	2	2	0	24
Walmart	5	3	4	2	0	14

Table 4.4 The entry frequency by number of other leading stores

# Entry	0	1	2	3	Total
Whole sample	112	40	16	2	170
Domestic chains	74	20	6	1	101
Emart	45	13	5	0	63
Lottemart	29	7	1	1	38
Foreign chains	38	20	10	1	69
Tesco	15	10	5	1	31
Carrfour	17	5	2	0	24
Walmart	6	5	3	0	14

Table 4.5 The frequency of entry by number of its own existing stores

	0	1	2	Total
#Entry	159	11	0	170
Emart	57	6	0	63
Lottemart	36	2	0	38
Tesco	29	2	0	31
Carrefour	23	1	0	24
Walmart	14	0	0	14

Table 4.6 Probit models of entry decisions on overall market structure

	Whole sample		Domestic		Foreign	
	1	2	3	4	5	6
Own	-0.48*** (-3.40)	-0.62*** (-4.51)	-0.44*** (-2.57)	-0.64*** (-3.84)	-0.54** (-2.12)	-0.58** (-2.39)
All	-0.13*** (-3.14)		-0.21*** (-3.63)		-0.03 (-0.56)	
Leading		-0.19*** (-3.30)		-0.30*** (-3.39)		-0.09 (-1.18)
Population	0.17*** (5.32)	0.17*** (5.36)	0.18*** (4.25)	0.18*** (4.18)	0.15*** (3.24)	0.16*** (3.40)
Aaprt	1.45*** (5.87)	1.42*** (5.79)	1.43*** (4.35)	1.32*** (4.08)	1.51*** (3.97)	1.57*** (4.15)
Bigcity	0.01 (0.18)	-0.006 (-0.08)	-0.07 (-0.72)	-0.10 (-1.04)	0.13 (1.15)	0.12 (1.06)
Constant	-3.32*** (-15.4)	-3.33*** (-15.5)	-3.37*** (-11.7)	-3.32*** (-11.7)	-4.10*** (-12.1)	-4.16*** (-12.2)
Nobs	6400	6400	2560	2560	3840	3840
LogL	-689.97	-689.35	-381.78	-382.63	-301.52	-300.96

Note that period and chain dummies included are not reported here. Asymptotic t-statistics in parentheses

Table 4.7 Probit models of entry decisions on domestic/foreign rivals' presence

	Domestic		Foreign	
	1	2	3	4
Own	-0.61*** (-3.65)	-0.65*** (-3.87)	-0.59** (-2.42)	-0.59** (-2.42)
Diff	-0.24* (-2.29)	-0.25** (-2.39)	-0.17 (-1.64)	-0.17 (-1.65)
Same		-0.39*** (-2.62)		-0.03 (-0.29)
Population	0.16*** (3.76)	0.18*** (4.16)	0.16*** (3.47)	0.16*** (3.47)
Aaprt	1.18*** (3.71)	1.33*** (4.09)	1.59*** (4.23)	1.61*** (4.22)
Bigcity	-0.10 (-0.96)	-0.10 (-1.04)	0.12 (1.06)	0.12 (1.05)
Constant	-3.16*** (-11.6)	-3.32*** (-11.7)	-4.18*** (-12.3)	-4.20*** (-12.2)
Nobs	2560	2560	3840	3840
LogL	-386.14	-382.33	-300.30	-300.26

Note that period and chain dummies included are not reported here. Asymptotic t-statistics in parentheses

Table 4.8. Probit models of individual chain's entry decisions on overall market structure

	Domestic		Foreign		
	Emart	Lottemart	Tesco	Carrefour	Walmart
Own	-0.66*** (-3.26)	-0.62** (-2.03)	-0.41 (-1.28)	-0.66 (-1.58)	-
Leading	-0.23** (-1.98)	-0.36*** (-2.70)	-0.13 (-1.14)	-0.13 (-0.76)	0.01 (0.12)
Population	0.18*** (3.23)	0.19*** (2.75)	0.16** (2.20)	0.16 (1.47)	0.22** (2.11)
Aaprt	1.04** (2.48)	1.63*** (3.19)	1.63*** (2.71)	1.94*** (3.01)	0.77 (0.96)
Bigcity	-0.10 (-0.79)	-0.13 (-0.79)	0.07 (0.45)	0.30 (1.51)	-0.04 (-0.18)
Constant	-3.01*** (-10.5)	-2.99*** (-9.85)	-4.24*** (-7.92)	-3.74*** (-8.56)	-3.89*** (-7.18)
Nobs	1280	1280	1280	1280	1280
LogL	-230.01	-152.50	-126.81	-101.97	-65.79

Note that period dummies included are not reported here. Asymptotic t-statistics in parentheses

Table 4.9 Probit models of individual chain's entry decisions on domestic/foreign rivals' presence

	Domestic		Foreign		
	Emart	Lottemart	Tesco	Carrefour	Walmart
Own	-0.68*** (-3.35)	-0.62** (-2.03)	-0.46 (-1.41)	-0.72* (-1.67)	-
Same	-0.45** (-2.02)	-0.32 (-1.55)	0.04 (0.27)	-	0.18 (0.83)
Diff	-0.16 (-1.21)	-0.40** (-2.16)	-0.29* (-1.78)	0.08 (0.46)	-0.13 (-0.59)
Population	0.18*** (3.23)	0.19*** (2.76)	0.16** (2.20)	0.09 (1.22)	0.23** (2.15)
Aaprt	1.06** (2.52)	1.63*** (3.19)	1.66*** (2.72)	1.75*** (2.76)	0.69 (0.85)
Bigcity	-0.10 (-0.73)	-0.12 (-0.78)	0.07 (0.42)	0.32 (1.60)	-0.05 (-0.23)
Constant	-3.03*** (-10.5)	-3.64*** (-9.50)	-3.09*** (-8.88)	-3.78*** (-8.55)	-3.85*** (-7.13)
Nobs	1280	1280	1280	1280	1280
LogL	-229.29	-152.46	-125.76	-102.16	-65.23

Note that period dummies included are not reported here. Asymptotic t-statistics in parentheses

Table 4.10 A multivariate probit model of entry decisions on overall market structure

	Domestic		Foreign		
	Emart	Lottemart	Tesco	Carrefour	Walmart
Own	-0.66*** (-3.28)	-0.60** (-1.99)	-0.44 (-1.36)	-0.67 (-1.61)	-
Leading	-0.23* (-1.94)	-0.34** (-2.55)	-0.11 (-0.99)	-0.12 (-0.74)	0.02 (0.14)
Population	0.18*** (3.21)	0.18*** (2.68)	0.15** (2.05)	0.12 (1.60)	0.22** (2.15)
Aaprt	1.04** (2.49)	1.60*** (3.16)	1.66*** (2.77)	1.91*** (2.99)	0.80 (1.00)
Bigcity	-0.11 (-0.82)	-0.09 (-0.60)	0.09 (0.54)	0.26 (1.28)	-0.02 (-0.11)
Constant	-3.01*** (-10.5)	-2.98*** (-9.93)	-4.24*** (-7.91)	-3.75*** (-8.63)	-3.92*** (-7.27)
Nobs	1280				
LogL	-670.98				

Note that period dummies included are not reported here. Asymptotic t-statistics in parentheses. LR test rejects the hypothesis that there is no correlation among errors at 5 percent level.

Table 4.11. A multivariate probit model of entry decisions on domestic/foreign rivals' presence

	Domestic		Foreign		
	Emart	Lottemart	Tesco	Carrefour	Walmart
Own	-0.68*** (-3.36)	-0.60** (-1.99)	-0.51 (-1.52)	-0.72* (-1.71)	-
Same	-0.42** (-1.92)	-0.32 (-1.54)	0.04 (0.28)	-	0.18 (0.87)
Diff	-0.15 (-1.19)	-0.37** (-2.03)	-0.28* (-1.73)	0.07 (0.40)	-0.12 (-0.59)
Population	0.18*** (3.23)	0.18*** (2.70)	0.16** (2.16)	0.11 (1.49)	0.24** (2.20)
Aaprt	1.07** (2.55)	1.64*** (3.22)	1.69*** (2.76)	1.64*** (2.59)	0.76 (0.91)
Bigcity	-0.09 (-0.73)	-0.12 (-0.74)	0.08 (0.51)	0.31 (1.52)	-0.08 (-0.35)
Constant	-3.02*** (-10.6)	-3.64*** (-9.50)	-3.07*** (-8.75)	-3.80*** (-8.61)	-3.93*** (-7.14)
Nobs	1280				
LogL	-665.67				

Note that period dummies included are not reported here. Asymptotic t-statistics in parentheses. LR test cannot reject the hypothesis that there is no correlation among errors at 5 percent level.

Table 4.12 Sequential entry game: entry decisions on overall market structure

	Domestic		Foreign		
	Emart	Lottemart	Tesco	Carrefour	Walmart
Own	-0.36 (-1.58)	-0.64** (-2.07)	-0.44 (-1.36)	-0.70* (-1.65)	-
Leading	-0.31** (-2.39)	-0.39*** (-2.91)	-0.19 (-1.64)	0.006 (0.04)	0.10 (0.67)
Population	0.19*** (3.39)	0.21*** (2.94)	0.18** (2.40)	0.10 (1.26)	0.21** (1.96)
Aaprt	1.15*** (2.68)	1.74*** (3.34)	1.79*** (2.90)	1.81*** (2.78)	0.61 (0.75)
Bigcity	-0.09 (-0.72)	-0.13 (-0.79)	0.08 (0.45)	0.31 (1.57)	-0.04 (-0.17)
Constant	-3.10*** (-10.5)	-3.05*** (-9.82)	-3.18*** (-8.94)	-3.84*** (-8.01)	-3.48*** (-6.52)
Nobs	1280	1280	1280	1280	1280
LogL	-229.00	-151.79	-126.07	-102.26	-65.57

Note that period dummies included are not reported here. Simulated maximum likelihood estimation methods are employed. Asymptotic t-statistics in parentheses

Table 4.13. Sequential entry game: entry decisions on domestic/foreign rivals' presence

	Domestic		Foreign		
	Emart	Lottemart	Tesco	Carrefour	Walmart
Own	-0.71*** (-3.44)	-0.64** (-2.08)	-0.51 (-1.52)	-0.69 (-1.56)	-
Same	-0.56** (-2.49)	-0.33* (-1.79)	0.06 (0.35)	-0.59 (-1.46)	0.28 (1.48)
Diff	-0.21 (-1.58)	-0.44** (-2.31)	-0.37** (-2.34)	0.19 (1.12)	-0.10 (-0.48)
Population	0.20*** (3.46)	0.21*** (2.95)	0.18** (2.30)	0.10 (1.32)	0.23** (2.07)
Aaprt	1.20*** (2.76)	1.75*** (3.36)	1.78*** (2.83)	1.76*** (2.73)	0.51 (0.61)
Bigcity	-0.10 (-0.73)	-0.12 (-0.75)	0.07 (0.43)	0.32 (1.54)	-0.08 (-0.34)
Constant	-3.15*** (-10.4)	-3.78*** (-9.34)	-4.37*** (-7.81)	-3.84*** (-7.99)	-3.84*** (-7.04)
Nobs	1280	1280	1280	1280	1280
LogL	-227.72	-151.71	-124.43	-99.92	-64.46

Note that period dummies included are not reported here. Simulated maximum likelihood estimation methods are employed. Asymptotic t-statistics in parentheses

Table 4.14. Sequential entry game: entry decisions on large/small chains' presence

	Large chain			Small chain	
	Emart	Lottemart	Tesco	Carrefour	Walmart
Own	-0.73*** (-3.50)	-0.65** (-2.08)	-0.51 (-1.52)	-0.64 (-1.47)	-
Large	-0.49** (-2.84)	-0.39** (-2.25)	-0.37** (-2.35)	0.08 (0.56)	0.01 (0.09)
Small	-0.08 (-0.52)	-0.40* (-1.74)	0.06 (0.35)	-4.23 (-0.02)	0.26 (1.02)
Population	0.20*** (3.43)	0.21*** (2.95)	0.18** (2.30)	0.11 (1.32)	0.21** (1.99)
Aaprt	1.19*** (2.75)	1.75*** (3.35)	1.78*** (2.83)	1.77*** (2.71)	0.55 (0.68)
Bigcity	-0.10 (-0.77)	-0.13 (-0.78)	0.07 (0.43)	0.32 (1.56)	-0.04 (-0.19)
Constant	-3.14*** (-10.4)	-3.05*** (-9.74)	-4.37*** (-7.81)	-3.87*** (-7.93)	-3.82*** (-7.01)
Nobs	1280	1280	1280	1280	1280
LogL	-227.45	-151.66	-124.43	-100.77	-65.28

Note that period dummies included are not reported here. Simulated maximum likelihood estimation methods are employed. Asymptotic t-statistics in parentheses

Chapter 5

Conclusion

To analyze the competitive impact of foreign firms in the host economy, this thesis has investigated the competitive behaviour of foreign firms using empirical settings in Korea. I set up two competing hypotheses: (1) as the popular belief argues, foreign firms as newcomers could introduce more competitive behaviour to the host economy; or (2) as an alternative argument anticipates, the essence of oligopoly may underlie the competition between foreign and local firms. Three empirical studies, one of the price competition in homogenous industries, one of the price competition in a differentiated product industry, and lastly one of entry decisions, have demonstrated that foreign firms have no significant impact on market competition in the host economy. (1) In the test on the competitive impact of foreign acquisition, it is found that foreign acquisition does not lead to an increase in market competition. (2) The study on price competition in the grocery superstore industry finds no difference or rivalry between foreign and local firms in their pricing behaviour. An additional test demonstrates that the difference between leading and small chains stands out, suggesting the rivalry among leading chains. This finding can also be viewed as reinforcing the main findings, given that the leading chains are a group of both domestic and foreign firms. (3) Another study on firms' entry behaviour draws an inference that an intense rivalry among leading firms emerges rather than the

rivalry between domestic and foreign firms. All these findings give strong support to the alternative view on the competitive role of foreign firms: foreign firms act as a member of oligopoly group rather than as a kind of maverick in a market. That is, in understanding the nature of competition in oligopoly, the essence of oligopoly is a fundamental factor.

The results have important implications for government policies toward FDI inflows. Apart from the effects on macro variables, such as capital formation and employment, the benefits of FDI inflows greatly depend on the competitive effect of foreign firms and the potential technology transfer from foreign to local firms. And FDI firms' competitive pressure on local firms is viewed as one of the main channels for the technology transfer. Therefore, the popular belief that foreign firms act as new competitive forces underlies the policies to promote FDI inflows. However, the results of this thesis raise a serious question about this reasoning. To the extent that foreign firms behave as a member of an oligopoly group, the benefits obtained from foreign firms can be very limited. To realize the potential benefits of foreign firms' entry, therefore, government action should be directed to developing more efficient and competition-enhancing policies.

In arriving at these results, this dissertation follows the basic idea of the NEIO paradigm. Compared to the previous studies examining the margin effects of foreign firms, this thesis attempts to model and estimate pricing or entry behaviour. The underlying assumption is that price-cost margins are not properly observable, since marginal costs cannot directly be observed. Hence, this dissertation tries to measure the impact of foreign firms on market competition by comparing a conduct

parameter to measure the level of market competitiveness, or by inferring the underlying competitiveness of the market from observed entry behaviour.

Another distinctive feature is the emphasis on a single industry or very closely related markets within an industry. The previous studies relied on a cross-sectional study, implicitly assuming that industry-specific factors could be controlled by a small number of observable measures. They asked whether the presence of foreign firms helped to explain variations in margins across industries. In contrast, this thesis views industry-specific factors as not controllable in this way, following the argument of NEIO. A straightforward solution is to use a single industry or very closely related markets which share industry specific features in common. Within the context of a single industry, then, I ask whether foreign entry leads to an increase or decrease in market competition, or foreign presence produces intense rivalry between domestic and foreign firms.

The focus on a single industry provides another advantage of examining the impact of M&A FDI and greenfield FDI separately. Even though a different entry mode of FDI may lead to different competitive consequences, a cross-sectional study is not able to control fully for the possible heterogeneity between M&A and greenfield FDI. In contrast, in each empirical setting of this dissertation, only one type of FDI firm is involved. Foreign firms appear to make acquisitions to avoid adding capacities in mature industries, while they rely on greenfield FDI in a newly developing industry. This feature allows us to examine each impact respectively.

Turning to each empirical study, Chapter 2 compares the pricing behaviour between two periods before and after foreign acquisition. In developing an empirical

model, I borrow the basic idea from Sumner (1981), who attempts to proxy market competitiveness in the responses of prices to marginal costs. To overcome a problem of his method that estimation results greatly depend on the demand specification, I construct a reduced form of pricing equation based on a very general form of demand function. This is possible by focusing on relative changes rather than the absolute levels of market competitiveness. Then I compare the level of market competitiveness between two periods to examine the impact of foreign acquisition. In interpreting the comparison results, partial information on marginal costs plays a crucial role, where the information on costs is obtained from the simple fixed-coefficient production technologies employed in the sample industries.

For the empirical estimation, the study exploits the sharp distinction in foreign firms' role found in several industries in Korea. The structural stability apart from foreign acquisitions during the sample period leads us to ascribe the change in market competitiveness, if any, to foreign acquisitions. The existence of a recession period just following the economic crisis could cast doubt on the results, since the degree of collusion may have increased in the recession period. In an attempt to control for the likely effect of the recession period on market competition, I exclude the recession period from the sample period, obtaining qualitatively similar results.

To check the validity of the methodology, I conduct a simple experiment by taking advantage of prior information on the relative level of market competitiveness in the LPG (Liquefied Petroleum Gas) industry. The methodology has shown a good predictive power in finding the relative changes in market competitiveness. A possible extension of this empirical test would be to compare the prediction of this

methodology with that from a standard NEIO study that estimates a system of demand and pricing equation. Certainly, such an extension greatly depends on the availability of quantity data.

To further the examination, using the development of the grocery superstore industry in Seoul, Chapter 3 asks whether foreign firms' pricing behaviour is more competitive or whether domestic firms react to foreign presence more sensitively. In building the model, the study employs a reduced form of pricing equation based on a simple logit demand. In contrast to other studies, I do not impose any specific equilibrium concept, but set up a model to measure the level of market competitiveness relative to the Bertrand competition.

The well-known IIA property of the logit model is viewed to reflect well the reality of the grocery superstore industry, given that the superstore sector as a new industry is replacing other formats of grocery stores. Identifying local markets also helps to alleviate the problem of the restrictive pattern of substitution in the logit model. In dealing with unavailable quantity data, I construct a market share variable based on the parking space of superstores. Since market share is viewed to be predetermined, this study adopts a simple OLS procedure. Along with the main result, the practice of traffic builders is found. While setting less competitive prices on other items, superstore chains charge lower prices on high-selling items to attract more customers.

A further study is possible in several aspects. The study employs a reduced form of pricing equation, lacking the estimation of demand side. A richer data set with market share and consumer characteristics can further the examination, allowing

for more relaxed substitution patterns than a simple logit model. In addition, the fact that the study uses a small number of items called traffic builders limits the generalization of the results. Expansion to items other than traffic builders may reveal different patterns of pricing policies.

Chapter 4 examines entry decisions by firms in the superstore industry. Compared to Chapter 3 looking at superstores in Seoul, the data set here is comprehensive of all the stores in Korea, which allows us to capture a whole picture of competition in this sector. The empirical model is formulated as a discrete choice model, following Bresnahan and Reiss (1990) and Berry (1992). A sequential move game concept is introduced, which secures the existence of a unique equilibrium. An order of entry is assumed where larger chains move first and smaller chain follow next, which implies that two domestic chains make decisions first with foreign firms following. As a robust check, I try alternative orders of entry, finding similar results.

In dealing with the endogeneity problem in the leaders' estimation, I extend the simulation methodology proposed by Toivanen and Waterson (2001) into an oligopoly industry. The underlying intuition is that early movers take account of the optimal responses of followers in their decisions. The comprehensive firm-level data set allows for asymmetry in entry behaviour among chains. Given that there are significant differences in firms' responses to market conditions, the results raise doubts about the common practice to implicitly assume identical entry behaviour among firms.

The simulation methodology implicitly assumes perfect knowledge of leaders of followers' actions. This ignores any uncertainty involved in firms' entry

decisions, which can arise in the real world. A more realistic set-up to allow for uncertainty would deepen our knowledge about the underlying nature of firms' entry behaviour. This thesis has assumed that superstore chains make independent decisions on every market-period combination, without considering entry decisions on other markets or future decisions. Therefore, another extension would be to explicitly consider the multi-store operation in chain-store industries or its dynamic nature in modelling entry decisions.

Returning to the main hypothesis of the thesis, the competitive impact of foreign firms can vary over time. Even if it is the case that foreign firms, as newcomers into a market, act in a more competitive way initially, as they age and become native, they are more likely to get accustomed to the prevailing pattern of cooperation among their domestic counterparts. Therefore, we might observe hardly any behaviour of foreign firms distinguishable from home-based firms, if we examined the impact after that point in time space. Given the fact that foreign firms' entry is a new development in Korea, however, the empirical settings in this dissertation safely exclude this possibility.

There could be another long-term effect of foreign firms on competition. As they may out-compete and drive out their domestic rivals from the market thanks to their cost or technology advantages, foreign firms could raise market concentration. This possibility has received much attention from a number of researchers, although the empirical evidence is not clear enough to draw a conclusion. However, this thesis has not considered this dynamic aspect, since the empirical settings do not allow us to look into this. Of an interesting future work would be an empirical study to

examine if foreign firms lead to an increase or decrease in concentration, using time series data.

Another limitation arises from the narrow scope relating to the impact of greenfield FDI firms. MNCs can be favoured potential entrants into concentrated national markets where high entry barriers are blocking local potential entrants. Therefore, these markets will be, in equilibrium, less concentrated and thus more competitive if MNCs may enter them. This could be one possible way in which greenfield FDI firms contribute to increasing market competition. To check this possibility, many studies have examined the relationship between foreign entry and entry barriers, finding a positive relationship between them. Focusing on the competitive behaviour of greenfield firms after entry, however, this dissertation has not looked into this kind of competitive impact of greenfield FDI firms.

A last point is related to the nature of a single industry study. To avoid the shortcomings of a cross-sectional study, I return to the old tradition of a case study on individual industries. A problem with this is that the focus on a single industry cannot come without the loss of generalization. The results of this dissertation may only be restricted to the industries in question. As the proponents of a single industry study emphasize, the competitive impact of foreign firms might vary across industries and across countries, depending on their specific circumstances. To build up more generalized results, we need to wait for more studies on other industries and other countries to come.

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